



PROCEEDINGS
OF THE
MEETING OF THE BOARD OF FORESTRY
HELD AT
THE FOREST RESEARCH INSTITUTE
DEHRA DUN

31st OCT. to 3rd NOV. 1942.

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(To be taken up on

Tuesday, the 3rd Nov.)

10. War and post-war policy of the Forest Research Institute.

11. Forest Education.

12. A general co-ordinated study of bamboos.

13. Regulation of fellings after the war to absorb accumulated Army stocks
by consumers (Punjab).

MEMBERS PRESENT AT THE MEETING OF THE BOARD OF FORESTRY, 1942.

Hon'ble Sardar Sir Jogendra Singh, Kt., Member-in-Charge of the Department of Education, Health and Lands, Government of India. (Chairman.)

Hon'ble Mr. Upendranath Barman, Minister-in-Charge of Forests-Excise, Bengal.

Hon'ble Pir Illahi Bakhsh Nawaz Ali, Minister-in-Charge of Forests, Sind.

Mr. S. H. Y. Oulsnam, C.I.E., M.C., I.C.S., Secretary to Government of India, Department of Education, Health and Lands.

Mr. S. H. Howard, I.F.S., Inspector General of Forests to the Government of India and President, Forest Research Institute and Colleges.

Sir Harold Glover, I.F.S., Chief Conservator of Forests, Punjab.

Mr. W. G. Dyson, M.C., I.F.S., Chief Conservator of Forests, Madras.

Mr. W. T. Hall, C.I.E., I.F.S., Chief Conservator of Forests, United Provinces.

Mr. C. M. Harlow, C.I.E., I.F.S., Chief Conservator of Forests, Central Provinces and Berar.

Mr. D. B. Sothers, I.F.S., Chief Conservator of Forests, Bombay.

Mr. J. D. Atkinson, I.F.S., Conservator of Forests, Burma.

Mr. T. M. Coffey, I.F.S., Conservator of Forests, Bengal.

Mr. D. Davis, I.F.S., Conservator of Forests, United Provinces.

Mr. G. R. Henniker-Gotley, D.S.O., I.F.S., Conservator of Forests, North-West Frontier Province.

Mr. J. T. Morehead, I.F.S., Conservator of Forests, Burma.

Mr. M. W. Nicholson, C.I.E., I.F.S., Conservator of Forests, Orissa.

Mr. L. Potty, I.F.S., Conservator of Forests, Sind.

Mr. C. E. Rangaswami, M.F.S., Chief Forest Officer, Coorg.

Sabhaiwal, I.F.S., Conservator of Forests, Bihar.

Simmons, I.F.S., Conservator of Forests, Assam.

In a short

the Director

the Board

Department of Education, Health and Lands, as well as the members

As I heard, Mr. Howard said:—

few days gentlemen.

of this visit I shall have to inflict my voice on you a good deal during the next I want to say as little as I can now. First of all on behalf of the officers of the Forest Research Institute, and I am sure I can say on behalf of all of you, that to extend a hearty welcome to our new Hon'ble Member Sir Jogendra Singh who, in the midst of many other duties, has found time to come here and preside at this Board meeting. Sir Jogendra Singh is well known to forest officers in the north of India as he lived for many years very near one of our largest forest divisions in the U. P. He is closely associated with our work and he knows our activities. This is his visit to Dehra Dun but I sincerely hope that he will find time to visit the Institute frequently in future."

"Next on behalf of my own staff I would like to welcome all of you. It is many years since senior officers of the I. F. S. met together at a Board of Forestry meeting and, even though this is war time, I hope you will agree that meeting together and exchanging views will have an excellent effect on all of us. May I add that in my opinion the most important part of this conference is outside the conference room where you can meet each other and talk over your problems as between man and man without the formality necessary perhaps here. This particular meeting of the Board of Forestry is historic in that for the first time we are honoured by the presence of ministers. It is the first time that ministers have been present at a Board of Forestry meeting and it is hoped—and it was intended by the Joint Parliamentary Committee—that, in future, Boards of Forestry should have not only forest representatives but ministers from all provinces as well."

"A good many items have been suggested for discussion for which there is unlikely to be enough time. It has, for instance, been suggested that in correspondence between ourselves we cease to have the honour of belaboring each other's obedient servants. I think we might perhaps agree that in future we use memo form."

"I now ask Sir Jogendra Singh to open this meeting."

In opening the meeting of the Board the Hon'ble Sir JOGENDRA SINGH said:—

"Mr. Howard and Gentlemen—I must thank you for the warm welcome you have given me, and I am glad to be here with you at this first meeting of the Board. It is years since I enjoyed the hospitality of Sir George Hart, the then Inspector General of Forests, when I came to Dehra Dun to assist in selecting candidates for the Imperial Forest Service. The Colleges and the Forest Research Institute were still in the making. It was the ambition of one of my predecessors—the late Sir Narasimha Sarma—to raise the Forest College up to the highest European standard. I rejoiced when on the 1st of November 1921 the College opened its doors to receive candidates and I deeply regretted when after a very short period of six years its doors were closed on the 1st November 1922."

"I am glad to know that Provinces have been driven to recognise the need of highly trained officers and the College has been opened again. I am pleased to know that the standard prescribed for the Indian Forest College is the same as the degree course of a British University leading up to the grant of the College diploma in Forestry. It will be for you to consider whether any further improvement is necessary in the course at the Indian Forest College or the Indian Forest Rangers College."

"I am gratified to know that the Research Institute has suffered no loss. It has proved its value in these difficult days of war. Research finds a way when it begins to cater for the public needs and helps in meeting the urgent requirements in creating new industries."

"I am glad that the Research Institute under the fostering of Mr. Howard has substantial achievements to its credit. Its Botany, Entomology, Chemistry and Minor Forest Products Branches have made a material contribution to meet the demands of the Army. The Institute has been instructing officers in the art of identifying various varieties of timber, and has been exploiting other sources of vegetable rubber, producing oils from chir pine for developing processes which have enabled a firm to produce disinfectants for our troops. The Institute has produced ephedrine from ephedra, rotenone from derris and medicinal tar from pines. It has determined the kind of wood best suited for generating producer gas."

"The Timber Testing Section has tested ammunition boxes, army boxes, crates for sola topis, propellers, species for plywood, glue joints, packing cases, containers and a number of other special articles completing nearly half a million tests. It has discovered a new form of construction using hard wood dowells for roof trusses and bridges, saving a considerable amount of metal and money. In one case the application of this discovery saved six lakhs of rupees. The way to defeat armies of white ants has been found and adopted by the Supply Department and seasoning in kilns has proved its value and gained in popularity. There are 68 kilns now at work."

"The Wood Working is generally a supply unit for the Institute but it has broadened its scope of activities and made plywood containers, laminated hoot lasts, naval plywood, test ammunition boxes. A cold setting adhesive and new glues from indigenous products have been evolved to replace casein and other types of cements needed for naval and other uses."

"The Institute has proved that India has suitable timber for use in aircraft, which was considered out of the question a few years ago. There are now three officers on special duty exploiting spruce and fir for this purpose. A large variety of plywood containers have been constructed at the Institute as substitutes for metal containers, ranging from one-pound tins and canisters to sturdy 50 gallon drums for road tar. They have been accepted by the Army

"May I now turn from the achievement of the Institute to the formation of the Board which it is my privilege and pleasure to open today. It was a happy idea conceived in 1931 that the Ministers-in-charge of Forests and Forest Officers and experts should meet together every three years and formulate permanent policies. The first meeting of the newly constituted Board was called to meet early in 1939, but Provincial Ministers resigned and the meeting was postponed. It is unfortunate that popular Provincial Governments have not re-started to function."

"Eight years have sped their way. New problems have arisen. The need of taking counsel on the general policy for research and education and forest administration during the war and to plan for the future is the reason for our thinking here today. Indeed I feel that though the Board could meet every five years, it would be an advantage if Junior Forest Officers could meet every year and discuss from their own technical point of view questions of general interest and importance at a Forest Officers' Annual Conference in the same way as the Central Board of Irrigation."

relate to, or not presume to dwell on the numerous matters in the agenda which or two particular chemical matters on the broader aspects of forestry. There are one

[illegible]

“It was recognition of the importance of preserving forests that led the Government of India in 1891 to define its forest policy which was declared to be, on the one hand, the protection of the forests and, on the other hand, the maintenance of the rights of the inhabitants unless in the larger interests of the community restriction became inevitable. The terrible ravines of the Chambal and of the Jamna which have devastated the face of a once fair land were not caused by mismanagement by the local inhabitants but by the denudation of forests in the Himalayan hundreds of miles away.”

1 "In addition to the growing of actual forests the remedies against floods and erosion are the growing of shelter belts of trees or growing of leguminous crops which help to enrich the soil, and where erosion has gone too far coarse grasses or sedges can be grown as a preliminary to the introduction of more valuable crops. The spread of ravines can be prevented by proper management. By controlling grazing ravines clothe themselves with grass and indigenous shrubs. Such measures call for co-operation of the villages and such co-operation has been largely achieved in some parts of the Punjab. The only reason why vegetation has disappeared in most parts of India is because man indiscriminately hacked and burnt the trees, and has grazed his animals without control and without realising that the land can only support a definite

amount of grazing. It should never be forgotten that to attempt to use animals as a remedy for soil erosion without at the same time controlling man and animals is a waste of time and money."

"The question of proper land management to prevent the devastation, which has spread over so many other countries after disforestation, from laying waste our own fair country has been the subject of debate in various committees connected with the Imperial Council of Agricultural Research, and at last it has been agreed by the Advisory Board of the Imperial Council of Agricultural Research that an officer should be appointed to collect information and to crystallise the problem.

"Naturally the forests have engaged most of the attention of our Forest Officers. The time has, however, come when they should include the villages as one of their responsibilities. The need of 7,00,000 villages in the matter of tree plantations has so far received scant attention. It may be useful to take a group of villages and start plantations. Land could be rented for the purpose and trees planted to provide fuel and timber and grass for feeding the cattle. These village plantations may prove of great economic value, saving the cow-dung for manure, and may even provide large quantities of material for making humus and manure."

"Another direction to which I may invite your attention is that there are vast areas which climatic conditions make it impossible to bring under cultivation. It may be possible to lift water for irrigation, for starting plantations, in to grow trees which require a minimum amount of water. An experiment in this direction may enable the afforestation of areas which now lie was classed as culturable but cannot be cultivated."

"Increased production from land depends on providing plant food by the most ing the soil with manure. Adequate supply of manure is, perhaps, a magnificent important single problem connected with Indian agriculture. The of exuberant agricultural crops produced from virgin forest soil are the result of the fertility, giving by years of leaf shedding and slow decay into humus of the attention a first-class vegetable compost. It may well be a problem worthy of the attention of foresters and agriculturists, whether surplus supply of leaf mould from villages, could not by some method be transferred from the forests to the villages, without drawing on the requirements of the forest soil."

"Those villagers who are fortunate enough to live near forests get from them timber for their ploughs, grass for their houses and grazing for their cattle and a host of other material. In addition to that the fertility of their fields is largely increased and their water supply controlled by the protective influence of neighbouring forests. But what of other unfortunate villagers who have no forests in their immediate neighbourhood? What of the vast numbers who inhabit the enormous areas of the Punjab and the Gangetic Plain? They get none of these amenities, their cattle are often starved, their houses are poor, they are forced to use valuable manure for their fuel, their crops suffer in consequence and the lack of nourishment eventually affects the physique and health of man himself. It is one of our great problems not only to instil into the mind of the peasant the value of forests to him but if possible to bring the benefits enjoyed by those who inhabit the fringe of the hills near the forests down to the dwellers in the plains. Such work means spending money in initial stages to encourage the villager by actual demonstration how to grow forest for himself on all waste lands. In Madras, in Orissa and in the U. P. work is being done in this direction. Before the war put a partial end to these activities the Forest Development Officer in the U. P. had got a certain amount of work started in many districts of the plains in the U. P. and more especially in those hot and dry areas in the east of the province. There is room for vast improvement in this organisation which I trust will continue to expand even more rapidly than before."

In earlier days the primary duty of public servants was the administration of law and order; out of it grew a sense of superior aloofness which affected even such ancillary services as Agriculture, Forestry and Medical. They who were to become helpers became victims. The time has come when there should grow a greater sense of unity between the people and the officers. The nation building departments must win the confidence and trust of the people whose interests it is their duty to serve."

"In conclusion, I can assure you it shall be my anxious care during my tenure of office to help you to raise the College and the Institute to a premier position in India, so that the Forest Department may bring more and more areas under its beneficent activities and secure for the people better dwelling houses, a higher standard of living and above all a greater unity of will and purpose with a growing spirit of sacrifice, which is essential if India is to become a Sovereign State and maintain its sovereignty by becoming the protector of all, closing all controversies which have their root in distrust and misconceived ideas of sovereignty. A Sovereign Power, according to an ancient saying, fulfils its purpose only when it enables the tiger and the goat to drink from the same fountain and at the same time. (*Applause*.)

After the conclusion of Sir Jogendra Singh's speech, Mr. Howard said —

"Gentlemen,—We have made a change in the order in which the items on the agenda are to be taken up for discussion because the representatives from Orissa, Bengal and Assam and Bombay have not yet arrived and because the first two items need discussion in the presence of all the members. We have therefore to start with item number 5, namely, the desirability of establishing advisory Boards on Forest Utilisation in all Provinces. Mr. Trotter, the Utilisation Officer, will open this debate.

May I remind you, gentlemen, that we have a heavy programme to be got through during the time at our disposal, and it would therefore help if speakers could be as brief as possible."

ITEM 5.—DESIRABILITY OF ESTABLISHING ADVISORY BOARDS ON FOREST UTILISATION IN ALL PROVINCES,

By H. Trotter, Esq., I.F.S., Utilisation Officer, Forest Research Institute.

1. At the Forestry Conference of 1937 in Delhi, the President (the Hon'ble Kunwar Sir Jagdish Prasad) proposed the following resolution:—

"The Conference agrees that forest utilisation occupies an important place in forest administration and that the closest possible co-operation between the Provinces and the Forest Research Institute is desirable. It is of opinion that an Advisory Council on Utilisation might with advantage be attached to the Forest Research Institute and that adequate representation should be provided on the Council for industrial and commercial interests.

The Conference is also of opinion that similar advisory bodies in the Provinces could perform useful service and should be set up whenever and wherever circumstances permit".

2. The first part of this resolution had the support of practically all Provinces in India, and in 1939 the Central Government appointed the Central Advisory Board on Forest Utilisation, which met for the first time in April 1940. Its second meeting was held in April 1941.

3. The second part of the resolution was not endorsed unanimously. Some Provinces were of opinion that provincial advisory boards were not necessary, while others held the opinion that provincial boards would serve a most useful purpose.

4. In the end, the views of the various Governments were sent to all Provincial Governments for their information.

5. So far as is known, two Provinces only, namely, Bihar and Bengal, have the present established provincial advisory boards on forest utilisation.

"I notice that the Bihar Board has only 2 Forest Officers among 16 members, and that local Timber Associations, Chambers of Commerce, Railways, Agriculture, Forest Owners, the P. W. D., Universities, and the Legislative Assembly, are all represented."

"I think a Board of that type can serve a very useful purpose in that its Members bring a wide variety of new ideas and new viewpoints on forest affairs and that is healthy for all concerned."

"The Inspector General of Forests in one of his cyclostyled notes has emphasised that the main function of this Institute is to obtain results which will be of practical utility to Government and to the public. That holds good also for Provincial Forest Departments, and local Advisory Boards could do much to collect and disseminate valuable information not only from the Forest Department side but also from the point of view of the users or potential users of forest products."

"There is one other point I would like to mention, and that is the value of Advisory Boards to Local Governments and to the Heads of Provincial Forest Departments."

Mr. Bozman, Chairman of the Central Advisory Board, when addressing the Central Advisory Board, stressed this point. (He was speaking as a Secretary of the Department of Education, Health and Lands.) He said "It is my task to interpret technical requirements so that my exposition of them will arouse sympathetic consideration in quarters not noted for soft-heartedness or undue generosity". He went on to say "while the Government of India are anxious to stimulate useful and promising research work they cannot go further than their resources permit. It is exactly in this respect that the advice of the Board will be of greatest assistance", and he ended up by pointing out that a careful study of any project, with special reference to the requirements of industry, would afford a valuable guide to Government in determining the support they would give it."

"I think this point is worth the attention of all Heads of Provincial Forest Departments and also of the Hon'ble Members and Secretaries of Revenue Departments."

"Any scheme which has the support of a strong Board representing other Government Departments such as the Railways, Engineering Services, and Local Municipal and District Boards, in addition to Industry and Trade, must carry far more weight than a scheme put up by the Forest department only."

"I will not say any more, except to suggest that Members would probably be interested to hear the experiences of the representatives of Bihar and Bengal, the two Provinces which have started local Advisory Boards on Forest Utilisation."

Mr. L. R. Sabharwal (Bihar): "The Bihar Advisory Board on Forest Utilisation was constituted in 1939. The functions of this Board are:—

(i) to remain in close touch with the Forest Research Institute through the Central Advisory Board on Forest Utilisation;

(ii) to endeavour to make known to the public the technical and economic advantages and methods of using timber and other forest produce for various purposes;

(iii) to endeavour to collect and disseminate statistical and other information relating to the availability of timber and other forest produce and resources in the province;

(iv) to take suitable action to have the subjects of timber engineering and wood preservation included in engineering schools' and colleges' curricula;

(v) to endeavour to promote, as far as possible, the interests of persons engaged in trade pertaining to timber and other forest produce;

(vi) to start work in co-operation with the Forest Research Institute to build up gradually a permanent timber demonstration exhibition which should, if possible be located in Patna;

(vii) to investigate the possibility of starting forest cottage industries;

(viii) to suggest problems for investigation and lines of work at the Forest Research Institute, Dehra Dun.

"The Chairman of the Board is the Adviser to the Governor in Charge of the Revenue Department—he used to be Prime Minister before the Congress Ministry resigned—and the members—consist of the representatives of the Forest, Public Works and Agriculture Departments, Railways, Bihar Chamber of Commerce, Timber trade and others."

"The first meeting of the Board was held in October 1940. Among other things it considered the Resolutions passed by the Central Advisory Board on the triennial programme of research for the Forest Research Institute, Dehra Dun which were forwarded to the President of the Forest Research Institute for consideration and necessary action."

"In addition to this it made several recommendations to the local Government. I will mention a few of the more important ones with the action taken on each.

(1) "An Economic Botanist be appointed to make a survey of the extensive list of medicinal plants compiled by the Forest Department and of which neither the quantity nor the pharmaceutical values are known". Government have thus recommendation under their consideration and it is hoped that the services of the Economic Botanist attached to the Agricultural Department will be made available as soon as possible. I see that this is one of the items on the agenda for discussion. As far as Bihar is concerned we have therefore already taken action on this item.

(2) "The Conservator of Forests be requested to obtain information as to the total quantity of myrabolans available in the reserve and private forests of the province. When this information is ready the question of industrial utilisation in Bihar should be taken." Government have accepted this recommendation and would allot necessary funds for carrying out the enumerations as soon as normal conditions return. It may be noted that this work will be carried out not only in the forests under the control of the Forest Department but also in the private forests so that complete data for the whole of the province may be available. This is one of the points stressed in one of Mr. Trotter's note also.

(3) "In view of the importance of the match industry in the province plantations should be started of the species considered by the Conservator of Forests to be suitable in the Province to overcome past failure through want of suitable wood". Government have allotted funds for carrying out this recommendation and a start has been made this year.

(4) "The Director of Industries be requested to conduct demonstrations in the improved methods of kath extraction and explore the possibilities of kath as a dye stuff". The Director of Industries has taken up this matter.

(5) "The local Government should explore the possibilities of reviving the industry in manufacturing tool handles and textile machinery parts, for which with the encouragement of the Forest Department, Bihar a factory has been erected recently at Chakradharpur to put on the market timber seasoned and manufactured on the most up-to-date lines. It is, however, noted with regret that this factory, is not at present functioning in the manner this is desirable." This factory has since started work and is now engaged in turning out a large number of helves for the Defence Department. It has already supplied about 1,00,000 helves.

Mr. W. T. Hall (United Provinces): "Mr. Chairman, if a resolution is going to be passed on this item I would like to make it clear that I am not prepared to commit the United Provinces Government to adopt it. At the 1937 Forestry Conference the United Provinces did not agree to the second part of the Resolution of that conference referred to in Mr. Trotter's paper, although at that time we had a popular Government in the U. P. I am not at all convinced that Provincial Advisory Boards would be as useful as has been made out. And particularly during the war I am not at all in favour of setting up a Board of this sort. We are extremely busy with our main war job of the supply of timber, fuel and charcoal, and I feel that the proposed Board might actually retard our war work. Actually we have an open mind on this question for after the war, but we would prefer to postpone consideration till after the war."

following example. The Flora of British India states that trees belonging to the *litsaea* family grow abundantly in most Provinces and that more than 60 species are known. Chemical examination of the seeds of some of the *litsaea* indicated these to be an excellent source of lauric acid, which is of considerable commercial importance. Publication of the results elicited the information that an immediate demand for nearly 100,000 mds. of berries a year was there but when the forest departments were approached to supply the quantity, it was discovered that no more than a few hundred maunds could be collected, throughout India. If a proper survey had been made and information about availability of the berries known, much time and labour spent in working out the economic possibilities would have been saved. Many similar cases could be cited from amongst the minor forest products (yielding drugs essential oils, gums, etc.) and all these emphasise the need for reliable information regarding their relative abundance in different forest areas.

3. Those products which are put under the category of minor forests products appear to receive only minor attention from the forest officers even though these may yield a high proportion of the total revenue from forests. A source which yields such high revenues to the State certainly deserves better consideration and management, especially when these products have the potentiality of yielding much better financial results. With the increasing demand for raw materials from the rapidly developing Indian industries it is absolutely essential to have a thorough survey of the important minor forest products. It is only then that further economic exploitation, and proper planning of research on minor forest products would be possible.

4. It is not suggested that the Forest Utilisation Officers in the Provinces should conduct the survey. These officers are already overloaded with numerous duties and it would be impracticable for them to take on this heavy work. Appointment of a special Survey Officer, under the Conservator, Utilisation Circle would meet the case.

ITEM 8.—DESIRABILITY OF APPOINTING AN ECONOMIC BOTANIST IN EACH PROVINCE.

By S. Krishna, Esq., C.I.E., Biochemist, Forest Research Institute (Opening remarks by Dr. Krishna are at p. 18 *infra*.)

1. Under item 6 of the agenda, a case has been presented for the appointment of an officer for conducting surveys of minor forest products. Under the present item 8 it is intended to show the nature and scope of the work involved in these surveys.

2. Numerous species of herbaceous flora are found in our forests and many of them occur in super-abundance. It is of course unnecessary to survey all these plants. The surveyor should, from his own knowledge of plants of economic value and from the requirements of the trade and industry, be able to lay down an order of priority in which to make a start. He should first survey those species the possible value of which in industry is already known and thereafter take up those which are available in super-abundance (for example, *Lantana*) but the economic value of which is not known. It will be his duty to have these chemically examined and their possible uses determined. To undertake a work of this nature it is obvious that only persons with an excellent knowledge of botany, and preferably also of Chemistry, are best suited.

3. Numerous enquiries are received at the Forest Research Institute from the trade wanting to know where a particular species can be had. In the absence of reliable information such enquiries cannot be satisfactorily dealt with and the usual reply given is that the enquirer should get in touch with the Forest Utilisation Officer of the Province concerned. It is difficult to say if these officers deal with all such enquiries to the satisfaction of the trade. Traders are not interested in the habitat of the species. What they wish to know is the locality from which that species could be collected in commercial quantity. This information cannot be so easily given unless results of surveys are available. It needs no further stressing that such information when available would be of inestimable value for developing the trade and industry.

4. The 'Dictionary' of Economic Products of India compiled by Sir George Watt is a repository of information on important minor forest products and is still depended upon for locating the sources of raw materials. It was compiled about 1889 consequently the information given there is antiquated and not wholly dependable after 50 years. Its revision is being undertaken by the Commerce Department of the Government of India, and this Department will naturally look to the Provincial forests to supply reliable information on raw materials of economic value relating them. It is, therefore, necessary to have surveys initiated by persons best qualified to undertake them.

5. Many of the plants of economic value occur sparingly in patches and their collection on a commercial scale becomes expensive and uneconomical. *Scilla indica*, for example, is quite common in Dehra Dun forests and yet nowhere does it occur in such abundance that a few thousand maunds could be collected. This drug has now been included in the United States Pharmacopoeia but its collection and supply in large quantity, entirely from wild sources, is not economical. This plant could easily be cultivated and a 50 acre plot would easily supply a greater part of the demand at most economical and competitive rates. It will be the duty of the surveyor to point out such possibilities and to undertake, in active collaboration of the provincial utilisation officer, the experimental cultivation of such products. The data collected on such experimental cultivation would be invaluable in either fostering their growth in forest areas or in encouraging their cultivation being taken up by the agriculturists of the locality.

6. It is well known that the quality of many plants, growing wild, is vastly improved by cultural operations. Such experiments are of immense value to the trade. Derris a valuable insecticide, for example, in wild state contains no more than 2.3 per cent of rotenone, its active constituent, but by proper culture its yield has been increased to over 15 per cent. What an effect such efforts have on trade need no elaboration. Improvement in rotenone content of indigenous species, production of rich and hardy strains by selection and cross breeding, acclimatisation of foreign species are all problems still awaiting solution. Another example is that of vertiver oil. The grass (*Vertiveria zizanioides*) from which this oil is distilled is native to India, where a yield of about 2 per cent. of the oil is obtained. No one in India appears to have bothered to cultivate it with a view to increasing its oil content. The result is that the cost of distillation of the oil is high. It has consequently been ousted from the world markets by the oil distilled in Java where this grass has been improved by cultivation and made to yield over 4 per cent. of the oil. Several other examples could be cited to illustrate the importance of cultural experiments. Such attempts will be a natural corollary to the work on survey of economic plants and should form part of the duties of the surveyor. His work in this direction will not involve any study of climatic or soil conditions as his experiments will be conducted in an area which is the natural home of the species, but he will have to study the relationship between the vegetative growth and the yield of the active constituents and how far manurial treatment will affect the one or the other. Selection and propagation of the most desirable strain will be another important item for his investigation.

7. Harvesting of plants at the right season and preparation (such as drying, storage, grading, etc.) of products for marketing in accordance with specifications and trade requirements, are matters of prime importance in development of trade. These matters have been sadly ignored with the result that many a good and genuine product has failed to establish itself in the market. It would be the duty of the surveyor to collect information on these points and educate the collectors and traders in minor forest-products regarding the value of these factors. The Indian *artemisia* when it was first introduced in the European markets was not accepted because of its low content of santonin, its active constituent. Collaboration with an economic botanist soon helped to set matters right. Field observations showed that two varieties of the same species *artemisia* grow side by side, one of which is rich in santonin and the other is the

practically devoid of it. The distinction between the two varieties is visible only for a short period during their early age, after which all distinction is lost. This fading has had a far reaching effect in developing trade in Indian *artemisia*. It was also observed that sun drying destroys the santonin in *artemisia*. Proper care on these points has established *artemisia* in the world markets.

8. Deliberate adulteration and sophistication of a product is a curse in this country and many trade connections, in the past, have been lost for lack of proper care and supervision. One possible way to overcome this practice would be to open departmental depots for the sale of raw products. It will thus be possible to take rigid care to sort and grade the materials brought in by the villagers or petty contractors, who have not the training and information to distinguish richer varieties from the poorer and the best manner of preparing the products for the market, nor have they any conception of morals in trade. Such a step will help to raise the already low reputation of Indian products and secure confidence of the market. The excellent work done by the Forest Utilisation Division, Kashmir, in this direction, deserves commendation.

9. For the proper industrial development of the country the question of introducing some exotics of economic value will also have to be carefully looked into. This question has assumed great importance at the present moment when foreign supplies have been cut off. Some of the more valuable exotics, can be grown in some part or other of India, and such an attempt would help to make the country self-sufficient without entering into undesirable competition with products produced elsewhere. The desirability of introducing *Astragalus* spp. yielding gum tragacanth or *Ceratonia siliqua* in the arid regions of the North West Frontier Province may be cited as examples.

10. What has been stated above gives the main duties of the officer who is to undertake surveys of economic products and it is contended that a person best fitted to carry these out successfully should possess the training and qualifications of an economic botanist.

SUMMARY.

Salient points in favour of appointing an Economic Botanist in each province are given below:

1. Location of areas of abundance and collection of reliable data. (paras. 3 and 4).
2. Cultivation of some plants for the purpose of effecting economy in the cost of collection. (para. 5.)
3. Cultural experiments to improve the valuable constituents. (para. 6.).
4. Harvesting at proper season. (para. 7.).
5. Grading, sorting and preparation of the material for the market. (para. 6.).
6. Introduction of exotics. (para. 9.).

Opening remarks by H. Trotter, Esq., Utilisation Officer, Forest Research Institute.

Mr. Trotter.—“Item 6 deals with surveys of timber and other forest products.

The necessity for such surveys has been briefly outlined in my cyclostyled note on the subject and in a similar note by Dr. Krishna with special reference to minor products. I presume that you have all been able to read those notes.

There is no need for me to enlarge on the subject. The necessity of knowing what products are available before the establishment of new industries can be contemplated, is obvious.

It is unfortunately only too true that many promising industries have been abandoned owing to the lack of reliable information on the raw materials exploitable.

I would stress one point and that is the importance of taking into account the products of private lands and forests other than those owned by Government.

I could cite many examples of factories which are existing, or intend to exist, of timber drawn from private lands or forests outside the normal attention of the Forest Department. There are for example at this moment 2 plywood factories being established at Saharanpur and Daurala in the United Provinces, both of which have been told that they cannot expect to draw much of their requirements of timber from Government forests, but who, nevertheless, have satisfied themselves that they can obtain sufficient timber to maintain plywood mills in those places for some time.

I do not wish it to be thought that I am criticising the Forest Departments. Far from it. But as new industries and new factories are assets to a Province's development and as any such development must react to a Province's advantage, I would like to stress the importance, if and when surveys are made, of considering the possible supplies from sources other than Government forests.

Dr. Krishna, in his note, emphasises the importance of surveys being done before time and money are spent in research on the products concerned.

He suggests a Special Survey Officer in each Province. Another suggestion is that when Working Plans are being made, more attention should be paid to subsidiary and minor species. This of course refers more especially to timbers.

In conclusion, I would draw your attention to item 8 on the Agenda which deals with the appointment of Economic Botanists in the Provinces. The two subjects are closely allied, more especially where minor products are concerned, and an economic Botanist could undoubtedly perform useful work in making surveys of the possibilities of minor products, in fact it would be one of his chief duties.

As regards timber, Special Survey Officers would yield the best and earliest results, but Working Plans Officers could also play a valuable role in this connection if local Governments cannot run two special survey parties.

Mr. Hall.—“Mr. Chairman, there is one thing which I would like to say on Mr. Trotter's reference to new factories. It is all very well to say that the more factories we have in a province the more economic benefit to the province; but there is no use starting a factory unless you have got the raw material to supply the factory. At the present time there is only one plywood factory running in the U. P., and you can take it from me that factory is only kept going on its present output because we are supplying them with simal wood by heavy over-fellings, and I do not see how these other plywood factories referred to by Mr. Trotter are going to carry on after the war to any great extent, because the timber is not really available either from the reserve forests or from zamindari forests.

With regard to the proposed survey, we are definitely in general agreement, but it has to be remembered that we have not got the staff to carry out such a survey during the war. We are particularly keen on the proposed survey of minor forest products but this survey can also be taken up after the war, because of our very heavy commitments of war supplies.”

Mr. Dyson (Madras) expressed himself to be in general agreement with Mr. Hall.

Mr. Harlow.—“Mr. Chairman, I am rather inclined to think that, so far as timber is concerned, the case as it has been presented to us has been rather over-stated. Speaking for my own province alone, I do not think that there is any doubt that we have almost complete information about the timbers that are available in our province. We mark our coupes and felling series every year and we make a complete list of the trees. We also make a complete list of the trees we propose to retain. We have got this information for many years to come. Therefore, so far as C. P. is concerned, and so far as timber is concerned, the case is definitely over-stated as it has been put to us.

The next point that I want to make is that in trying to deal with these lists who want timber from our province, we find that the specifications

are always far too high for us. They want special timber, and they want it absolutely perfect. It might be remembered that the present trees marked for felling in the Central Provinces originated at a time when fires were the order of the day in the hot weather. Consequently the trees being felled now have suffered damage of some kind or another in their youth, and I cannot expect to give you a very high standard of timber until we are able to put on the market trees which have not been damaged by fire during their earliest youth. The factories of the description under discussion which need timber are not prepared to accept our stuff.

As regards minor products, everybody must agree that a survey of this type is absolutely necessary. The proposal will probably break down on the usual question of finance. If you are going to have one Economic Botanist in one province, he is going to do very, very little. These minor products generally occur in very special belts and to do a survey of thousands of square miles would take one Botanist a very long time. But if you are going to have a survey of this description carried out properly, you want an Economic Botanist and dozens of Assistant Botanists to help him if any real progress is to be made. We in the Central Provinces will certainly start on the same lines as has been suggested by Mr. Hall after war, but I agree with him entirely that until we finish with this war, there is no question that we shall not have staff to take it up."

The Hon'ble Pir Illahi Bakhsh Nairaz Ali.—"Sir, though my province (Sind) has not advanced industrially, I wish to point out that even during the war, countries which are in the thick of the fight, have been planning as to the future reconstruction of the world and even their programme is being prepared; that is, after the peace is concluded, they want certain programme to be ready for them to carry out. But it has been suggested here today that no definite decision need be taken which can bind the respective governments on this important matter of carrying out of surveys of products of economic value. But we are only advisory boards to advise what is to be done in the future. If we have got to put off everything till after the war, I think there must be no use our meeting here. Everybody knows that every province is very busy in the furtherance of the war effort and representatives like me could ill afford to come here and waste these few days. But having come and met here, I think we should advise the respective governments to start if they have got to start, I think, for the future they should be in a position to appoint certain extra officers to investigate the survey. I think they must undertake the survey of the possibility of the establishment of plywood factories. This is the time for the provinces to start thinking about it. After the war when reconstruction will begin we shall have no time for survey and other things. We must have a programme before us now for the nation. Many of the factories which are engaged in war work today will have to be diverted to certain other work after the war in the process of reconstruction of our own nation building services. Therefore, I think there is no use to put off everything till after the war and it would be better, as Mr. Trotter has suggested, that some survey should be made immediately, and I agree with him entirely that we should advise the respective Governments if they can afford to appoint their own officers to start working immediately, so that after the war we can immediately start work and not wait till another survey and then waste our time. This is my personal opinion which I wished to place before the Board."

Sir Harold Gloster.—"I think we have got two subjects here—one is timber and the other is minor products. When it comes to the question of timber, we all recognise that it is the duty of the Working Plans Officer to find out the various timbers which are now urgently wanted for war and about which the Central Institute here, especially Mr. Trotter, has not got sufficient detailed information. But the object of the working plan is to draw up a scheme of management for all trees that are of economic value. It is useless, for example, making a plan solely for *decidua* or *sal* when you have got half a dozen of species which are all paying to extract. So it is the duty of the Working Plans

Officer to consider what valuable species could be made available for our requirements. If you give some indication of the various species required provision will be made for them at every revision of the Working Plans automatically."

Mr. S. H. Howard.—"If you make any real attempt to make a survey of timber it will cost say Rs. 120, per sq. mile and you have 90,000 sq. miles of forest in India. Admittedly we know a lot about many timber species but it does not really affect the main argument. The main argument, I think, is that till some indication of a probable demand is given, no Government can afford to expend the very large amount necessary to make such a survey."

Chairman.—"There is one thing which Mr. Howard said which appears to me to be clear. I think research should always precede demand. Unless research discovers what is available and what can be achieved demand will not arise. It is true that it may not be within the financial resources of the provinces to spend Rs. 120, per sq. mile, but I think it would be helpful if we have surveys of the minor products carried out and make the information regarding timber available more readily accessible. I wonder if it is more readily accessible at the moment. I think the resolution may say that it is desirable to carry out this survey. I certainly feel that there is need for an Economic Botanist in each province."

Mr. C. M. Harlow.—"I do not think there is such a need at present because we can put the Working Plans Officer on to the job but at the moment they are fully engaged."

Mr. W. T. Hall.—"Then you might cancel some of your working plans to release an officer or two."

Chairman.—"I want to know the direction in which the Centre can help."

Sir Harold Glover.—"If the Centre can indicate that there is a definite demand then the provinces can undertake the survey."

Mr. S. H. Howard.—"I think the general sense of the House is as follows:—

The Board notes the opinions expressed. It agrees that such surveys are theoretically desirable but that they are very expensive and financially impossible at the moment."

Hon'ble Pir Illahi Bakhsh Nawaz Ali.—"It is not for the Board to express any opinion."

Mr. W. T. Hall.—"It is not only the question of finance but it is a question of staff also."

Sir Harold Glover.—"We have already got working plans organisations. All that is needed is to arrange for the regeneration and exploitation of all the valuable species. The only point is whether such a thing is possible during the war. But if you indicate that there is any demand for new species we will revise our working plans accordingly."

Mr. W. T. Hall.—"It would be extremely expensive to make an enumeration of all species."

Mr. C. M. Harlow.—"It is all really a question of finance. No Government will give us money for elaborate working plans and surveys of species that are of no immediate value."

Sir Harold Glover.—"But you do get results of such a survey even in your ordinary working plans."

Mr. C. M. Harlow.—"You are talking about species of high standard. We have got large areas of mixed species some of which are valuable and some are not."

Mr. W. T. Hall.—"We are in the same position."

Mr. W. G. Dyson (Madras).—"As far as timber is concerned I am inclined to think that working plans will cater for any new developments."

Mr. W. T. Hall.—"As far as the U. P. is concerned, we are all in general agreement with the proposal, subject to the condition that it would be restricted to those species for which there will be a demand in the near future."

Chairman.—"The position seems to be that so far as timber is concerned the various species are already known."

Mr. W. T. Hall.—"We have a fair amount of information already about timber but as regards minor forest products it is an extremely difficult business to make a survey."

Mr. C. M. Harlow.—"Could an economic botanist do 4 sq. miles a day? I do not think so for a moment."

Mr. W. T. Hall.—"We are not convinced that an economic botanist is absolutely necessary for this business. An ordinary forest officer with a special knowledge of systematic botany might suit us better in the provinces."

Mr. C. M. Harlow.—"I think your lines are quite correct."

(It was at this stage the Board considered it necessary that item No. 8, being directly connected with item No. 6, both the items should be discussed together.)

Dr. S. Krishna (Biochemist, Forest Research Institute) in opening the discussion on item No. 8 regarding the appointment of an economic botanist in each province, in conjunction with item No. 6 relating to the survey of timber and minor forest products, explained that his remarks as set forth in the memorandum already submitted, apply only to the minor forest products. He stated that for the economic development of the country many of the so-called minor forest products play a very important role and it was, therefore, absolutely essential for us to know what we have in our forests and where. This Institute, for example, receives a number of enquiries from industrialists and others wanting to know the exact localities wherefrom a particular herb or a drug could be obtained in commercial quantities. He pointed out that it is essential for the economic exploitation of a product to collect information regarding its relative abundance in different localities, particularly the areas from where large scale collection could be made. The trade is not interested in knowing the mere habitat of the plant. It was pointed out that while it is desirable to collect such information, it is not possible to do so immediately for all plants. For many of these, it could easily wait till better times come and yet there are several which need immediate attention and could not be postponed even for a short time. The case of the indigenous rubber yielding plants was cited as an example. Many of these plants yield latex and any of these might turn out to be a potential source of rubber. In a case like this, it was pointed out that the necessary data, if it had been available, would have been of inestimable value because they could then tell the War Resources Department with confidence the quantity of rubber that it was possible to obtain from these sources.

Dr. Krishna further referred to certain other products of economic value in which the shortage was being acutely felt owing to the stoppage of imports from countries which had passed into enemy hands, but in which India could have made considerable progress had the necessary data been available. He deprecated the view that such information should be collected only when urgent enquiries for its supply start pouring in.

Except for those which are gregarious, most of the plants of economic value occur widely scattered and their collection from forests does not always prove economical. Such plants have to be cultivated to reduce the cost of collection. The case of Java was cited where many of the forest products were being raised in plantations and where by grading and preparing the product for the market on the site, many more economies were effected, enabling them to compete in the world markets. Indian products, on the other hand, having passed through so many hands are always of poorer quality and suffer in comparison. It was in this field that an economic botanist would be most helpful, and would be able to advise the best and the most economical procedure to adopt.

Cultivation of plants with a view to obtaining supplies on the most economic basis may appear a simple solution but in reality it too is attended with many difficulties. Questions that arise in this connection are:—Is it possible to improve the active constituent of a wild drug by cultivation? What to cultivate and where? The experimental data and experience available for improving the yield and quality of the usual agricultural crops seem to be not of much help in the cultivation of medicinal plants. The question is far more complicated because

the word quality, in the case of medicinal plants, has not the identical meaning that it has when applied to agricultural crops. In this case it is not limited to obtaining the maximum yield per acre but encircles a wide chemical field aiming at the improvement of individual constituents of importance, such as oil, alkaloid, bitter principle, etc. To carry out work of this nature, it is obvious that the services of an economic botanist are absolutely essential. The question of introducing, in India, plants of economic value which grow in other countries is another useful line of work in which the economic botanist will be of great help.

Deliberate adulteration and sophistication of products is not uncommon in India and many valuable trade connections have been lost for lack of proper care and supervision in cleaning and grading. Now that there is a demand for Indian products, due to the closure of the markets in the East, India should make all efforts to recapture her lost markets.

Dr. Krishna consequently felt that each province should have an officer whose duty it would be to look after the items mentioned above. He made it clear that an economic botanist was the person best fitted for the post and if he happened to be a forest officer in addition, all the better for it.

Mr. Hall enquired whether there was any trained economic botanist immediately available.

Dr. Krishna replied that there were scores of economic botanists but they were all at present engaged on the agricultural side. He could not see any reason why they would not be able to get economic botanists or agricultural botanists with the necessary background for carrying out the survey.

Mr. G. R. Henniker Gotley asked whether surveys of minor forest produce could not be undertaken by private enterprise.

Dr. Krishna said that as a matter of fact there were private organisations who had information on many economic plants far more than the Forest Department possessed. He cited an example of a firm who obtains its supply of *Cocculus indicus* from Travancore without the Travancore Forest Department even knowing the existence of this product in their forests. In the face of such facts he could not help feeling that there was something wrong somewhere. He thought that the appointment of an economic botanist would help a great deal.

Chairman.—“I have listened with very great interest to the speech of Dr. Krishna. There are one or two points arising which need very serious consideration. One of these is that we must do something now to plan to keep the markets that we have captured. We should not lose them after the war and that should engage the attention of this Board. The other point is this. It seems clear to me that there are certain things which need further investigation. I suppose so far our attention has been concentrated on the various trees we have grown and in the years to come it may be necessary to give greater and wider attention to such minor products as *semul* and it may be necessary to put an economic botanist on to it. I was surprised to hear that so far even in the Centre we have no economic botanist and if the provinces may not be prepared to appoint economic botanists of their own I should certainly be prepared to consider the appointment of an economic botanist at the Centre. I shall be very glad to hear all the proposals the Board have to make and do my best to provide funds to carry them out.”

Mr. C. M. Harlow.—“I have one or two words to say which have a very considerable bearing on the question we are discussing now. Dr. Krishna mentioned casually that there was something wrong in a good deal of these trades in minor products. I think myself that I can put my finger on what is wrong. He mentioned for example the *kapok* industry. I am not very up-to-date in the *kapok* industry, but I believe some 50 years ago the industry was almost entirely in Indian hands. Indian traders have been robbed of it by Java which organised this industry really on sound and thorough lines and India lost the *kapok* industry because middlemen would adulterate it and there is the same kind of trouble with everything. For example, I can mention *lac* as another very important product of India and we are very nearly losing the whole of our *lac* industry because middlemen will adulterate it and until the trade sets its

own house right there is no use in our starting to work at the supply end. A very great deal has been done by the Lac Institute at Ranhi in organising the trade and in teaching the trade proper methods and I think we are barking up the wrong tree when we start at the production end of all these industries. Where India really needs to have a revolution is in its trade methods and this applies to nearly every one of these minor products."

Sir Harold Glover enquired whether Dr. Krishna could give some information of what has been done by the Kashmir Government which had set up an Institute for the use of minor products.

Dr. Krishna said that he understood that the Kashmir Government had set up what was called "Utilisation surplus" to finance the running of a Drug Research Laboratory. There drugs were collected by the Forest Department. All the drugs are graded in a central place and no one else is permitted to sell them except through the agency of Government. Anything new that is discovered is then worked up in the Drug Research Laboratory which in the past depended upon the Forest Research Institute as well as the Tropical School of Medicine at Calcutta for any advice and help as to the economic value of plants. By means of this organisation the Kashmir Government have been able to get better value for their money.

Dr. Krishna instanced the very low revenue produced by Chakrata Forest Division from the minor forest products which amounted to about Rs. 30 per year. According to him the reason for such a low yield was mismanagement. In his opinion in Dehra Dun alone there was as much as two lac of rupees worth of trade in medicinal plants and other plants of economic value. During the last two years *Scilla indica* came into prominence and yet he did not know whether the Forest Department had actually earned any revenue from this.

Mr. Howard drew a distinction between plants which take long time to grow like timber trees and plants which take a short time to grow like many minor forest products. In his opinion the economic botanist was of no great use on plants which take a long time to grow. If the economic botanist found half a dozen plants in an area which were extremely valuable, even then that would not take them much further since they had still got to grow the plants. This would be possible if they were quick growers maturing in a year or two or even in several years. They could then be grown more or less as an agricultural or plantation crop like pyrethrum or even tea or rubber. The economic botanist might find out the greatest possible production of such plants per acre. He referred to the point made by Mr. Harlow namely, that it was no use working at the production end without cleaning up all the methods of trade, and added that he had had the same complaint of adulteration from London. He thought that there was definitely room for an economic botanist, not perhaps to make a survey from the numerical point of view, but to compile lists of valuable and quick growing plants which could then be grown as pure crops. He pointed out that if there was room for one economic botanist at the centre, there might also be room for such men in the provinces as well. At any rate he suggested that there was definite need for an economic botanist at the Centre.

Mr. C. M. Harlow.—"I may have expressed myself a little badly when I spoke before but I may say that I am in entire agreement with every word that Mr. Howard said. I only wish to emphasize that in taking up this question we must also take up the question of the cleaning up of the trade. I think there is an enormous amount of work awaiting an economic botanist. In my own province I can only cite the example of rusa grass which is in great demand by the soap industry and this is, I am sure, going to be an important industry in India after the war. I know that the economic botanist would be of the greatest use to us firstly in identifying the actual variety of rusa grass which produces oil and then in telling us how and where to cultivate it. I may say that I have hitherto always been inclined to oppose field cultivation in Government forests. It is really the job of the Agriculture Department. I have had to revise that opinion during this war. I think I have been converted to the

other point of view, namely, that in dealing with many of these minor forest products the first part of the research work is to learn how to cultivate these things and that is our job and if we are to do it we must have an economic botanist. An ordinary forest officer is not capable in the first place of distinguishing the various varieties of rusa grass, for example. If we have an economic botanist to teach us how to plant it, then possibly we may be able to hand it over to the Agriculture Department but I am convinced now that the initial work does really lie with us in minor products of this type."

Mr. Hall was of the opinion that it would be an extremely good idea if an economic botanist could be appointed at an early date at the Centre.

Sir Harold Glover, in reply to a question by Mr. Hall whether the Kashmir Drug Research Institute was being run departmentally, said that the essential part of the organization in Kashmir was that they linked up the growth and production of the raw materials with the research and with industrial production.

Mr. Hall pointed out that the U. P. Government would not agree to the actual manufactured products being marketed by Government. The Forest Department should confine its activities to the production of the raw products and to prevent adulteration.

Dr. Krishna made it clear that when he was speaking he intended only experimental cultivation so that they could know the conditions how to guide and help the cultivator eventually.

On the question of the appointment of an economic botanist, Mr. Hall stated that in the United Provinces he would prefer a forest officer with specialised knowledge of botany. He also envisaged that there would be difficulty after the war to get funds voted by the Legislature for the appointment of a separate economic botanist. He would therefore prefer to appoint a forest officer already in service to act as an economic botanist to begin with.

Mr. Harlow mentioned the difficulty of getting a forest officer in each province, although he did not see any difficulty in getting an officer for the centre.

Sir Harold Glover maintained that an economic botanist need not necessarily be appointed for each province, but such an officer might be appointed in each regional area.

Finally it was agreed to record that—

"The Board considers that items 6 and 8 are so intimately connected that it is better to treat them together. It agrees that theoretically such economic surveys are desirable. But for timeliness it is often not possible to carry out such a survey, particularly during war owing to the very large expense involved till there is some indication of a demand for the particular species in the near future. When such a demand is likely, the survey is already automatically legislated for at the revision of working plans.

For minor forest products, however, such a survey is rather different and does not consist in expensive enumeration. Often it only means the identification of the plant with a record of the locality and soil where it is found and eventually its experimental cultivation as a crop.

The Board would like to emphasise the very great importance of the proper grading and cleaning of many of these minor forest products and it emphasises the necessity of taking steps to guarantee the purity of the article. It suggests that the Forest Research Institute might take up this matter and make recommendations.

It feels that in order to develop minor forest products it is necessary to link up—

- (a) the growth and production of the raw material;
- (b) the research necessary;
- (c) the actual industrial production.

The Board agrees that an officer in each region is advisable to do this work, preferably a forest officer with a knowledge of botany, and it considers that such an officer is needed at once at the Forest Research Institute."

ITEM 7—CO-ORDINATION OF REGENERATION POLICY WITHIN AND BETWEEN PROVINCES, WITH SPECIAL REFERENCE TO LIGHT HARDWOODS.

By H. Trotter, Esq., I.F.S., Utilisation Officer, Forest Research Institute.

1 In Great Britain and other European countries the ratio of softwoods to hardwoods used is probably in the region of 10 to 1. For example, in Great Britain the imports of conifers total some 800 million c.ft. per annum, while the imports of hardwoods total about 70 million c.ft.

2 In India, the opposite is the case, and the quantity of hardwoods extracted outnumbers the softwoods by about 10 times.

3 The imports of true softwoods into India averages about 6,50,000 c.ft. per annum.

4 This is direct evidence that more softwoods are required in India. The term "softwood" technically applies only to conifer woods, but conifer timber in India is restricted in general to the Himalayan areas, and light hardwoods are used as substitutes for the true softwood timber as understood in Europe.

5 In addition to the increased demand for softwoods for such purposes as light construction work, packing cases, general carpentry and furniture, there has been for some years an ever increasing demand for light hardwoods in India for such purposes as plywood, matches, bobbins and other textile mill requisites, cooperage, vehicle body building, picture and plate framing, and many other purposes.

6 Unfortunately India is sadly lacking in ample supplies of these light hardwoods, and many otherwise promising industrial projects have had to be rejected owing to an insufficient supply of suitable timber to support the enterprise.

7 Plywood is a case in point. The demand for tea boxes alone in India amounts to some 50,00,000 per annum. The production of Indian plywood mills is probably under 10,00,000 boxes per annum, and a large proportion of the Indian-made boxes do not come up to the same standard of quality as that of imported boxes. In addition to the big demand for tea boxes, there is a very extensive demand for commercial plywood in sheet form for constructional work, general joinery, furniture making and the many other purposes for which plywood is used. The Forest Research Institute has received literally scores of enquiries from industrialists who wished to exploit the obvious opportunities presented by the plywood situation in India, but in very few instances has actual exploitation resulted, owing, in the majority of cases, to lack of suitable timbers.

8 Another greatly expanding industry is the box and packing case trade. The expansion of industrialism in India naturally brings with it an increased demand for containers to pack the extra products in, and it does not need a prophet to foretell an ever increasing demand for box and packing-case woods in India.

At present, India is incapable of supplying the increased demand for light hardwoods for such purposes as those mentioned above, and it is the obvious responsibility of the Forest Departments in India to evolve a regeneration and planting policy to meet the needs of the country.

9 It has been argued that no one can foretell what type of timber will be required in 50 years time. That is true, and all that can be done is to attempt to predict future requirements from past experience and the most probable course of events.

10. Fashions in hardwoods, and more especially decorative hardwoods, are apt to change, but the demand for softwoods (and light hardwoods) has remained the same for centuries, and is more likely to increase than to decline.

11. The Utilisation Branch of the Forest Research Institute has from time to time advised the Central Silviculturist on the species most likely to be in future demand. The Central Silviculturist has passed this information on to the Provinces, and during the past decade or so, there has been a genuine effort in most Provinces to increase the percentage of light hardwoods in the forests under their control.

12. Silvicultural research has of recent years, been accelerated, both by the Central Silviculturist and the Provincial Silviculturists, on the regeneration problems of light hardwoods. It is suggested that what is required now is for the Provinces to intimate to the Central Silviculturist what they want to be done, so that the Central Silviculturist can help by correlating research work on the regeneration problems concerned.

13. It is however emphasised that this only refers to the correlation of research work in the subject. The arranging of a co-ordinated regeneration policy between the provinces is a much more difficult and very different problem and it is suggested that the Board should consider how best this can be done.

14. Members of the Board will no doubt be glad to exchange views and experiences in this connection, and after discussion, it may perhaps be possible to frame a resolution to co-ordinate regeneration policy within and between Provinces, with the ultimate object of increasing India's output of light hardwoods, for which there is such an urgent and increasing demand.

Mr. Howard.—"Item No. 7, although the paper has been written by the Utilisation Officer, really concerns the silviculture side more than it concerns utilization direct. I am assuming, of course, that you have read or will read what Mr. Trotter has written. Plywood now-a-days can be admitted as an industry of general utility. But periodically during my service—and I have no doubt during the service of all forest officers—excited industrialists have condemned the regeneration policy of the forest department and have emphasised that they should grow this, that or the other species which those particular industrialists happened to want. It has happened more than once that forest officers have been persuaded to grow special crops for special purposes, and long before those crops have attained maturity, the particular purpose for which they were grown no longer exists or a substitute has been found and the crops which were grown have become comparatively useless. What I therefore wish to suggest is that in formulating any regeneration policy, the Forest Department must aim to grow timbers of what may be called "general utility" and must not be persuaded to grow a timber for some special luxury use which may very often be replaced by a substitute."

Mr. Hall enquired how it was proposed to co-ordinate regeneration policy.

Mr. Trotter explained that the Forest Research Institute received many enquiries from industrialists who wished to start factories for such things as plywood or box-boards. The Institute usually refers such industrialists to the province concerned, which of course can give information about its own supplies only. On several occasions it has happened that the area contemplated by the industrialist was next door to another province or possibly to an Indian state, but the first Province was of course unable to give any information about supplies from the other sources. It was because of this unco-ordinated state of things that the Board had been asked to discuss the subject and perhaps find a way to ameliorate matters. *Mr. Trotter* pointed out that, as had been emphasized in his paper on the subject, they were not contemplating the production of any one species for a specific purpose but were talking about what are generally known as "utility light hardwoods" which in his opinion would always be in great demand. It was necessary to provide industrialists with some more reliable figures of production of these light hardwoods than are at present available, since the demand for these woods was likely to continue. Could not some means of co-ordinating regeneration and production figures be devised as between Provinces, States and Zamindari forests.

Mr. Howard was doubtful of the possibility of co-ordinating the regeneration policies of the various provinces.

The Chairman said that the problem to his mind could be divided into two. So far as the regeneration of the forests was concerned and the principal timbers were concerned, they were already grown, and there was no further scope for development than was being done. Then arose the question of the demand for trade for certain varieties of timbers. The point was whether they should be grown by the Government forests, or if they have any economic value, whether it could be recommended for private growers to establish plantations. It was

more or less an economic problem. The demand was increasing and it would have to be met. He wanted to know whether any definite opinion could be expressed for the guidance of private plantations.

After some further discussion, Mr. Trotter supplied to the members the following list of light hardwoods which are likely to find a continued market for several purposes.

Some suggestions for Light Hardwoods which are likely to find a continued market for several purposes.

Alnus nepalensis.

Alstonia scholaris.

Anthocephalus cadamba (kadam)

Betula alnoides (birch). A very good wood.

Bombax insignis (slightly superior to *senul*).

Canarium species (dhup).

Celtis australis (for sports goods and tool handles).

Cinnamomum species. Excellent timbers.

Dysoxylum malabaricum (white cedar).

Elaeocarpus spp.

Evodia roxburghiana (Known as Malabar aspen).

Gmelina arborea.

Hymenodictyon excelsum (haurang or kuthan).

Kydia calycina.

Lophopetalum wightianum

Maculatus species.

Millingtonia hortensis (nimi-chambeli).

Mitragyna spp.

Morus species (for sports goods, tool handles and other purposes).

Populus species.

Saccopetalum tomentosum.

Sideroxylon longepetiolatum (lambapatti). An excellent wood.

Terminalia belarica (bahera).

Trewia nudiflora (gutci).

It was finally recommended as follow:—

“The provinces are already alive to the large demand for light hardwoods and are growing them wherever the soil is suitable and is not already used to grow more valuable timber. For some years to come, supply is so much less than demand that a co-ordinated plan of regeneration between provinces is hardly necessary. But a time will come when a co-ordinated policy of regeneration and in fact of all forest productions between provinces will become necessary. It would add that some of these light hardwoods are sufficiently valuable and of sufficiently quick growth to offer possibilities of a profitable crop for private owners.”

ITEM 9 (4)—NEW ITEM.—PROVISION OF SINKING FUND FOR POST-WAR FOREST EXPENDITURE.

Sir Harold Glover.—“Before we finally break up, I would like to bring up for discussion a matter in which all Conservators and Chief Conservators in provinces are really very vitally concerned. At present every province is making money by heavy fellings for war outside the working plan prescriptions. And under the ordinary financial rules that money is credited to general revenues and cannot be reserved for use after the war. It is obvious that after the war there will be a drop in the revenues and, at the same time, expenditure on forest development will be very heavy. And what I would like to bring to the notice of Provincial Governments is the desirability of creating now special Development Funds. Unless it is recognised that a certain sum has been allotted now for expenditure on forest development in the future, it will be very difficult to get funds after the war.”

Mr. Harlow.—“We are putting the entire revenue from the forests now into our budgets. I do not know how far that is a wise policy. I entirely agree with Sir Harold Glover that we ought to have a Development Fund.”

In the discussion that followed, it was pointed out that certain provinces were not prepared to finance such funds unless the sums earmarked were considerable, say, Rs. 50 lakhs, in the case of the U. P. who had considered this proposal previously.

With the concurrence of the Chairman it was agreed that a formal resolution might be passed by the Board to be brought to the notice of Government.

The following resolution was agreed to:—

"The Board calls the attention of all Provincial Governments to the fact that as a result of advance felling of forest capital for war supplies, forest revenues are abnormally high and at the same time expenditure on the tending and general development of the forest property, which should be undertaken now, is being curtailed. After the war, therefore, not only should expenditure be expanded up to the normal, but a further increased expenditure will be necessary to make up the arrears of such work. It recommends strongly therefore that funds be created now out of excess profits to provide the expenditure necessary on forest reconstruction in the lean years which will follow the war."

ITEM 3.—EROSION & FORESTRY IN INDIA.

By Mr. A. L. Griffith, Esq., I.F.S., Silviculturist, Forest Research Institute.

Reasons for inclusion.—The inclusion of the subject in the agenda of the Board of Forestry meeting is due to the recommendations of the 5th silvicultural conference held in 1939. Shortly after the conference, copies of the resolutions were sent to all governments and heads of forest departments in the provinces and states and in February 1942 a complete printed record of the proceedings of the conference was similarly distributed. Hence it is only necessary here to quote the actual resolution itself.

Resolution on Item 12 of Silvicultural Conference.

Resolution on item 12—(Erosion and Forestry in India). Resolved that—

1. The following subjects concerned with erosion be more fully investigated than hitherto by the Silviculturists concerned:—

- (a) effect of control of grazing,
- (b) improvement of grass lands by stocking with better grasses, and by a study of ecological conditions,
- (c) effect of contour trenching upon the ecological balance and upon rates of growth of trees and grasses,
- (d) effect of contour trenching and gully plugging, upon run-off and flood control,
- (e) suitable materials for check-dams and gully plugging,
- (f) costings for contour trenching and gully plugging,
- (g) fodder trees,
- (h) maximum gradient up to which cultivation is advisable.

2. Existing information should be collected and made available as early as possible.

3. The conference suggests that the Imperial Council of Agricultural Research might wish to encourage erosion research in the *watt bandi* (contour ridging) and terracing of plough land. This is an integral part of the erosion problem but at present lies outside the scope of the forest department.

4. While this conference can hardly suggest administrative changes to provinces, it may perhaps call the attention of the Board of Forestry to the serious situation which has arisen in many parts of India. This has been emphasised by members of the forest service and by the Central Board of Irrigation. Various committees are dealing with the problem but in provinces where it exists and where there is no specific body to deal with it, perhaps the Board of Forestry could recommend that a committee of forest, agriculture and irrigation officers be appointed to deal with erosion control work.

Work on resolution paras. 1 & 2.—The silvicultural branch of the Forest Research Institute has examined existing information and this has been incorporated in two leaflets (a) Fodder trees in India and (b) Notes on some aspects of erosion control. Copies of these leaflets are attached to this note.

Resolution para 3.—Para. 3 of the resolution has been communicated to the Imperial Council of Agricultural Research but no information is so far available of what action (if any) they are taking on this particular aspect of the subject. The general action taken by the I. C. A. R. is discussed later.

Appointment of Joint Committees.—Para. 3 of the resolution calls the attention of board to the seriousness of the situation in many parts of India and in general suggests that the possibility of co-ordinating the work of the many existing provincial committees (which often overlap in function) should be considered. It also suggests that where no specific body exists to deal with erosion the Board should recommend the creation of suitable committees.

It is unnecessary here to detail the need for erosion control and it can be confidently assumed that forest officers are not alone in realising the great importance and urgency of the subject. It does however seem necessary to review very briefly the position in various provinces and to endeavour to indicate for the Board's consideration possible types of administrative machinery which might be suitable for dealing with erosion control work.

Existing provincial committees.—In some provinces several committees exist, in others none, to deal with the problem. Some of these committees are active others appear rather passive in their outlook but very little co-ordination of work or policy appears to exist.

Examples of committees dealing with the subject are the provincial flood committee of the Punjab and the U. P., the fodder and grazing committees of nearly all provinces, the I. C. A. R., the Jawahar planning committee, and the west Bengal forest committee, etc.

Need for inter-province and inter-state co-operation.—Erosion control is not only beyond the scope of a single department like the forest department (unless it were a complete department in itself such as the soil conservation department in the United States) but it frequently has to deal with areas extending over more than one province or state.

Political divisions such as provinces and states have administrative advantages but for effective erosion control it seems reasonable to take the river basins as the units. While on this point it should be remembered that even as the most visible effects of erosion are often found in the upper portions of the basins where the ground is often steep, direct control measures are often the most effective (and cheapest) in these upper parts. At the same time states or provinces that lie in the middle or lower parts of the basin although they may be the worst sufferers from abnormal floods, unwanted deposits of silt, etc., are unable to take active participation in these basin head control works.

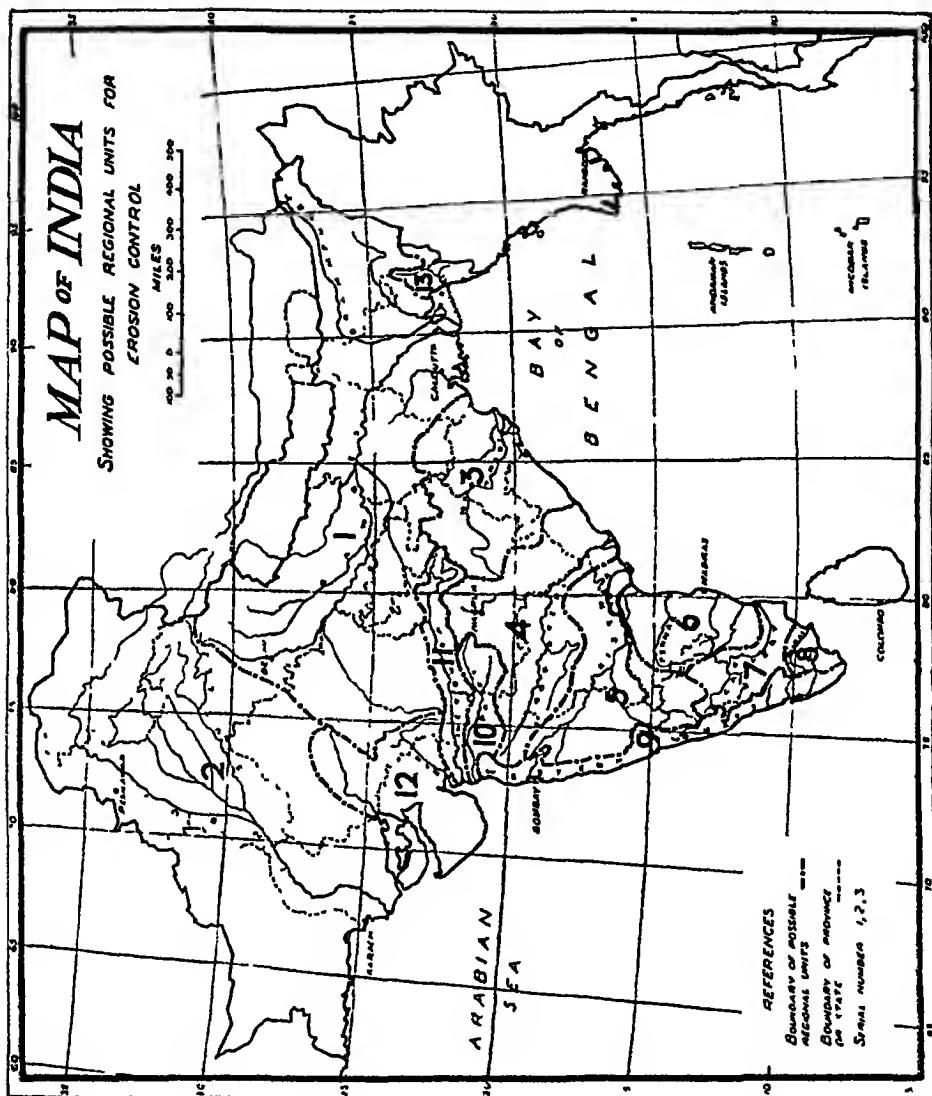
Possible administrative units.—From the above considerations it is suggested that some 13 basin units might be suitable for tackling this great problem in India.

The suggested units are—
NAME OF RIVER BASIN

PROVINCES & STATES INCLUDED IN WHOLE OR PART.

(1) GANGES-BRAHMAPUTRA.	U. P., Bihar, Bengal, Assam, C. P., Delhi, Garhwal, Simla hill states, Punjab states, Gwalior, C. I. Agency, Tripura, Cooch Bihar and Eastern States.
(2) INDUS-SUTLEJ.	Punjab, N. W. F. Province, Sind, Baluchistan Agency, Punjab States.
(3) MAHANADI.	C. P., Bihar, Orissa, Eastern States.
(4) GODAVERI.	C. P., Madras, Bombay, Hyderabad, Eastern States.
(5) KISTNA.	Madras, Bombay, Hyderabad, Mysore.
(6) PENNAR & others.	Madras, Mysore.
(7) CAUVERY.	Madras, Coorg, Mysore.
(8) VAIGAI & others.	Madras Travancore.
(9) WESTERN GHATS.	Bombay, Madras, Cochin, Travancore.
(10) TAPTI.	Bombay, C. P.
(11) NERBUDA.	C. P., Bombay, C. I. Agency, Gwalior.
(12) MAHI & others.	Sind, Rajputana Agency, Gujrat, Gwalior, C. I. Agency, Baroda.
(13) KARNAPHULI & others.	Bengal and Tripura.

SHOWING POSSIBLE REGIONAL UNITS FOR
EROSION CONTROL

[illegible]

A map of India showing the proposed units is attached, but these divisions, as will be readily granted, are inchoate and only designed eventually to lead to a fully acceptable form. Some are large and some comparatively small, some obviously urgently important while others on a preliminary investigation might prove relatively unimportant.

Localised land planning committees.—For each of these regions there might be a special officer who would first of all decide in which parts of the area he considered effective erosion control work essential. His investigation would need the co-operation of representatives of the agriculture and irrigation officers (presuming the special officer to be a forest officer). He might carry out a preliminary survey and then allot land according to the uses to which it should, most suitably be put consistent with the controlling of incipient erosion. These recommendations could then be sent to the respective local governments and states for orders for future action. It might be that the preliminary investigations would show that erosion control might not be necessary for the area but even so there appears to be no justification for omitting the examination of the area as the data necessary for basing judgments cannot be acquired from indirect sources.

West Bengal Forest Committee—It is neither possible nor necessary here to refer to the vast subject itself but a brief mention must be made of the work of some conferences and committees that have dealt with the subject from the point of view of practical work for what is urgently needed is action and not words.

The report of the West Bengal forest committee which was charged with the task of determining necessary measures, if any, in the districts of Midnapore, Burdwan, Birbhum and Bankura, for the conservation of the forests which remained, for the re-afforestation of areas denuded of forests and for the afforestation of areas now unproductive in consequence of deforestation is a useful record. The committee spent 25 days on tour. The period from the date of Government resolution appointing the committee to the draft report stage covered one year (July 1938 to July 1939). The committee's recommendations are comprised in the provisions of a draft private forests bill. The draft bill proposes to constitute an authority called the "regional forest officer". The R. F. O. can require the preparation of a working plan by the owner of a forest and the carrying out of the provisions of the approved plan, failure being constituted a crime punishable under the provisions of the draft bill. Afforestation can also be undertaken at the instance of the R. F. O. and suitable machinery is provided.

Punjab.—A committee was appointed in April 1931 in the Punjab to enquire into the extent and causes of denudation and erosion in the low hills of that province and to consider the form of suitable action to be taken. The committee concluded its work in October 1932. It accepted Holland's report as presenting an accurate picture of the state of the low hills in the districts they visited and made recommendations in respect of three districts. It also recommended the appointment of a forest officer on special duty to experiment in the training and reclamation on the lines suggested in LEETE'S book entitled "Regulation of rivers without embankments".

Bombay.—A Bombay deputation, consisting of 2 forest officers, 1 P. W. D. officer and 1 agricultural officer went round erosion works in the Punjab about a year ago and wrote a concise and useful report on what they saw. This is an excellent example that might profitably be extended by other provinces and states to other provinces and states.

I. C. A. R. Advisory Board.—The advisory board decided at its meeting of May 1941 that the I. C. A. R., should strongly move the central government for the immediate appointment of a special officer to investigate anti-erosion problems and in addition the secretariat of the council should send round the note of the agricultural commissioner and a copy of the discussion at the

meetings of the departmental research committee and the board to the provinces and states with the recommendation that they should take suitable action in the matter so as to improve the existing conditions in consultation with the forest and agriculture authorities.

In February 1942 the I. C. A. R. elaborated the above conclusions a little further by resolving that—

(1) small anti-erosion projects should be proceeded with without waiting for the appointment of a special officer.

(2) a special officer should be appointed who should study the problem of erosion for one catchment area and also in less detail the position in respect of the whole country. An abstract of his general report to be prepared in popular language. Provinces and states could then be asked to take suitable action.

The I. G. forests is a member of the advisory board of the I. C. A. R. and will no doubt inform the board of forestry in greater detail of the intended work of the I. C. A. R.

Land management.—A reference is also necessary to "Land management in the Punjab foothills" GORRIE (1941). It deals with the subject of erosion control in the light of the main trend of the present paper of a land planning policy

Cost of erosion control.—Most of the more intensive erosion control works have been done in the Punjab. The areas concerned have an unstable soil and a low rainfall. The rainfall is peculiar in that although it is low in quantity yet this quantity often falls in a few very heavy and concentrated showers thus causing an intensive erosion problem. Works to combat it are in consequence often expensive. Experience has shown that in the greater part of India where there is a serious erosion problem such extreme climatic and soil conditions do not occur and that the erosion control measures needed are not so detailed or expensive (e.g. it has been shown in a number of places that fire protection and closure to grazing or strict control of grazing is probably all that is needed). The opinion has often been expressed that excellent as the work of the Punjab has been it has tended to give an exaggerated impression of the cost of erosion control applicable to most of India and that the result has been that in some cases provinces and states have been frightened off undertaking urgent and useful erosion control work by the possibility of committing themselves to a large expenditure. In view of this possibility the board might like to discuss the point and express an opinion on it in their resolution.

Connection with item 4. Grazing—It is also brought to the attention of the board that item 4 (management and improvement of forest grazing) largely deals with the question of the control of grazing and the limitation of its incidence to what an area can stand. This is also one of the fundamental needs in practically any form of erosion control methods. The two subjects of erosion control and grazing should really be considered together.

Action proposed.—It is one of the functions of the board of forestry to discuss administrative questions common to several provinces, *vide* the resolution on subject No. 3 (b) of the board of forestry of October 1934. Erosion control work demands a special administrative machinery common to provinces for which the silvicultural conference of 1939 suggested a possible solution. It is therefore suggested that the subject should be discussed and an appropriate resolution adopted.

FODDER TREES IN INDIA.

There has of late been a growing demand for a list of tree species that are suitable for lopping for fodder in India. The Animal Husbandry Wing of the Agricultural Research Council in India has already been collecting useful information regarding fodder grasses and general fodder supplies in collaboration with the central and provincial fodder and grazing committees.

The attached list of fodder trees will, it is hoped, usefully supplement the existing information. The list does not make any claim to scientific accuracy, but merely represents the consolidated opinions of forest officers throughout India regarding the relative suitability, or it would be better to say, the relative popularity of different tree species for lopping for fodder. It is emphasised that this list has not taken into consideration the silvicultural characteristics of the trees, so that when a tree is classified as a good fodder it does not necessarily mean that it would be easy to grow or would be suitable for using for making fodder leaf plantations. It will be necessary to select from the list trees which, besides being good fodder trees, are of vigorous habit, are likely to give high yields of fodder, and above all, are suitable to the climate and soil of the locality in which it is proposed to grow fodder plantations.

The method of collecting the information given in the attached lists was as follows. The Central Silviculturist circularised all provincial silviculturists, who in turn circularised divisional officers, asking them to send in lists of trees that were lopped for fodder in the reserved forests in their divisions, classifying them as good, moderate or bad fodder trees according to their popularity with the local graziers. The opinions received were often at variance with each other, but in the attached list the different species have been classified according to the majority of opinions.

That lopping for fodder in *reserved forests* varies in intensity in different parts of India is evident from the replies. It was reported, for instance, from Bihar that "trees are not lopped for fodder in the province,"—(referring presumably to reserved forests). No information was received from Madras; and it was necessary to go to the provincial forest working plans to find information on the subject, and the list is, therefore, by no means complete as far as Madras is concerned. Apart from these two provinces, it is believed that the list is fairly complete and representative of local opinion regarding the relative merits of the different species for fodder.

M. V. LAURIE,
Silviculturist, F. R. I.

4th August, 1939.

A list of trees, shrubs and climbers, etc. that are lopped for fodder in different Provinces.

Statement I.—Species generally considered good for fodder.

Statement II.— " " " medium for fodder.

Statement III.— " " " poor (or so far unclassified) for fodder.

References (abbreviations.)

In column 2 :—

T=Tree (middle or large-sized.)

t=Small tree.

S=Shrub.

C=Climber.

S/t=Shrub or small tree.

C/S=Climbing shrub.

In column 3 :—

G—Locally classed as good fodder.

M= " " " medium fodder.

P= " " " poor fodder.

G/M= " " " good to medium fodder.

M/P= " " " medium to poor fodder, etc.

U= " " unclassified.

* &+ against the province refer to the corresponding entry in the remarks column (1).

STATEMENT I.—Good Fodder Species

Species (arranged alphabetically).	Tree, shrub or climber.	Provinces in which used, with local classification.	Remarks.
1	2	3	4
<i>Abelia triflora</i>	S/t	Punjab (G)	Specially for goats.
<i>Acacia arabica</i>	T	*Bombay (G/M), C. P. (G), Punjab (G), U. P. (M).	Pods specially for goats and sheep.
<i>A. modesta</i>	T (thorny)	Punjab (G).	
<i>Acer</i> spp.	T	N. W. P. (G), Punjab (G).	
<i>Anopeltos pendula</i>	S/t	U. P. (G).	
<i>Artocarpus chaplasha</i>	T	Assam, (G).	
<i>A. integrifolia</i>	T	Bengal (G), Bombay (G)	Ripe fruits also.
<i>Bassia butyracea</i>	T	*Bengal (M), U. P. (G)	*Hill forests.
<i>B. (Syn. Madhuca) latifolia</i>	T	*Bombay (P), C. P. (G), Orissa (G), U. P. (M).	*Flowers and fruits also.
<i>Bauhinia malabarica</i>	T	C. P. (G), Orissa (P), U. P. (G).	
<i>B. variegata</i>	T	Assam (G), *Bengal (M), Bombay (U), C. P. (G), Punjab (M, P), U. P. (G).	*Plains and lower hills.
<i>Boehmeria macrophylla</i>	S/t	U. P. (G).	
<i>Brassia-nopis hispida</i>	t (prickly).	Bengal (G)	Hill forests.
<i>B. nutis</i>	t	Bengal (G)	Hill forests.
<i>Callicarpa macrophylla</i>	S	U. P. (G).	
<i>Celtis australis</i>	S/t	N. W. P. (G).	
<i>Cordia myca (Syn. C. alliqui)</i>	T	Assam (G), Bombay (G/M), C. P. (G), U. P. (M).	
<i>Dalbergia lanceolaria</i>	T	Bombay (G)	Specially for buffaloes.
<i>D. latifolia</i>	T	Bombay (G), C. P. (G), Orissa (G), U. P. (M).	
<i>Debregeasia velutina</i>	S	Bengal	Hill forests.
<i>Desmodium pulchellum</i>	S	Orissa (G).	
<i>D. tiliae folium</i>	S	N. W. P. (G)	For buffaloes.
<i>Eriolobus hookeriana</i>	t	C. P. (G).	
<i>Erythrina stricta</i>	t	Bombay (G).	
<i>Eugenia jambolana</i>	T	*Bombay (M), C. P. (G), Orissa (G), U. P. (M).	*Fruits also.
<i>E. operculata</i>	T	U. P. (G).	
<i>Excoecaria acrifolia</i>	S	U. P. (G).	
<i>Feronia elephantum</i>	T	*Bombay (U), U. P. (G)	*For goats and sheep
<i>Ficus bengalensis</i>	T	Bengal (U)	Plains and L. hills.
<i>F. clavata</i>	S/t	U. P. (G).	
<i>F. cuneata</i>	T	Assam (P), *Bengal (U), U. P. (G).	* Ditto.
<i>F. elastica</i>	T	Bengal (G)	Hill forests.
<i>F. gibbosa</i>	t	Bombay (G), U. P. (G).	
<i>F. glomerata</i>	T	Assam (M), *Bengal (G), + Bombay (G/M), C. P. (G), Orissa (M), Punjab (G), U. P. (G).	*Teral and L. hills. + Fruits also.
<i>F. hispida</i>	T	Assam (P), *Bengal (G), Bombay (G), U. P. (M).	*Plains and L. hills.
<i>F. hookeri</i>	T	Bengal (G)	Hill forests.
<i>F. infectoria</i>	T	*Bengal (G), + Bombay (M), C. P. (M), U. P. (G).	*Plains and L. hills. (Specially for elephants) + Fruits also.
<i>F. nemoralis</i>	t	Bengal (G)	Hill forests.
<i>F. palmata</i>	t	Punjab (G), U. P. (G).	
<i>F. religiosa</i>	T	Assam (G), Bombay (G/M), C. P. (G), Orissa (G), Punjab (M/P), U. P. (M).	Specially for elephants.
<i>F. rumphii</i>	T	Assam (G), Bombay (P), Punjab (M/P), U. P. (G).	
<i>Fraxinus xanthoxyloides</i>	S/t	Punjab (G)	Himalayas—(dry zone).
<i>Gmelina arborea</i>	T	*Bombay (G), C. P. (G), Orissa (G), U. P. (M).	*Fruits in particular.
<i>Grewia asiatica</i>	T	Madras (U), U. P. (G).	
<i>elastica (Syn. G. vestita).</i>	T	Assam (P), Punjab (G), U. P. (G).	
<i>G. oppositifolia</i>	T	Punjab (G), U. P. (G).	

1	2	3	4
<i>Grewia tiliaefolia</i> . . .	T	*Bombay (G/M), C. P. (G), Madras (U), Orissa (P), U. P. (G).	*For buffaloes.
7 <i>Hardwickia binata</i> . . .	T	Bombay (G), C. P. (G), Madras (U).	
<i>Indigofera</i> spp. . . .	S	Punjab (G).	
<i>I. pulchella</i>	S	Orissa (G), Bombay (U).	
<i>Ixora nigricans</i>	t	Bombay (G).	
<i>Lannea grandis</i> (Syn. <i>Odina wodior</i>). . . .	T	Assam (G), *Bengal (M), Bom- bay (M/P), C. P. (G), Orissa (G), U. P. (G/M).	*Plains and L. hills.
<i>Laurocerasus</i> (Syn. <i>Pru- nus</i>) <i>acuminata</i>	t	Bengal (G)	Hill forests.
<i>Lonicera</i> spp. . . .	S	Punjab (G).	
<i>L. quinquelocularis</i> . . .	S	N. W. F. (G)	For goats.
<i>Melia azedarach</i>	T	Assam (G), C. P. (G), Punjab (M/P), U. P. (M).	
<i>Millettia auriculata</i> . . .	G	C. P. (M), Orissa (G), U. P. (G).	
<i>Moringa oleifera</i> (Syn. <i>M. pterygosperma</i>). . . .	t	Assam (G), C. P. (G), U. P. (M).	
<i>Morus alba</i>	T	Punjab (G), U. P. (G).	
<i>M. indica</i>	T	Assam (G), *Bengal (G) . . .	*L. hill forests and valleys.
<i>M. serrata</i>	T	Assam (G), N. W. F. (U), U. P. (G), Punjab, Kulu (G).	
<i>Olea cuspidata</i>	T	N. W. F. (G), Punjab (G).	
<i>Ougenia dalbergioides</i> . .	T	Bombay (G/M), C. P. (G), Orissa (P), Punjab (M/P), U. P. (G).	
<i>Populus ciliata</i>	T	N. W. F. (G), Punjab (G), U. P. (M).	
<i>Promna latifolia</i>	t	U. P. (G).	
<i>Pterocarpus marsupium</i> . .	T	Bombay (G), C. P. (M), Madras (U), Orissa (G), U. P. (G).	
<i>Quercus dilatata</i>	T	N. W. F. (G), Punjab (G), U. P. (G).	
<i>Q. ilex</i>	T	N. W. F. (G), Punjab (G), U. P. (G).	Dry zone.
<i>Q. incana</i>	T	N. W. F. (G), Punjab (G), U. P. (G).	Hill forests.
<i>Q. lanuginosa</i>	T	N. W. F. (U), U. P. (G).	
<i>Q. semecarpifolia</i>	T	N. W. F. (G), Punjab (G), U. P. (G).	
<i>Schofflera impressa</i> (Syn. <i>Heptaplourum impressu- sum</i>). . . .	T	Bengal (G)	Hill forests.
<i>Schleichera oleosa</i> (Syn. <i>S. trijuga</i>). . . .	T	Bombay (G/P), C. P. (G), Orissa (G), Punjab (M/P), U. P. (M).	
<i>Sesbania aegyptiaca</i> . . .	S	Bombay (G).	
<i>S. grandiflora</i>	t	Bombay (G).	
<i>Spatholobus roxburghii</i> . .	G	U. P. (G).	
<i>Storeulia pallens</i>	T	U. P. (G).	
<i>Stereospermum suaveo- lens</i>	T	*Bombay (U), C. P. (G), Orissa (U), Punjab (M/P), U. P. (G).	*For buffaloes.
<i>Stranvaesia glaurescens</i> . .	t	U. P. (G).	
<i>Strobilus asper</i>	t	Assam (G), Bombay (M), Orissa (G), U. P. (M).	
<i>tyrax serrulatum</i>	S/t	Bengal (G)	Plains and L. hills.
<i>Tamarindus indica</i>	T	Bombay (M/P), C. P. (G), Madras (U), Orissa (P), U. P. (G).	
<i>Terminalia paniculata</i> . .	T	Bombay (G).	
<i>T. tomentosa</i>	T	Bombay (G/P), C. P. (G), Orissa (M), Punjab (M/P), U. P. (G).	
<i>Trema politoria</i>	S/t	U. P. (G).	
<i>Trevesia palmata</i>	t	Bengal (G)	Terai, Duars and L. hills.
<i>Ulmus wallichiana</i>	T	Punjab (M), U. P. (G).	
<i>Wendlandia exserta</i>	t	Assam (M), U. P. (G).	

1	2	3	4
<i>Zizyphus jujuba</i>	T	Assam (M), *Bombay (G/M), *C. P. (G), Orissa (G), Punjab (G), U. P. (M).	*For goats and sheep.
<i>Z. nummularia</i>	S (thorny).	Punjab (G), U. P. (G).	
<i>Z. xylopyra</i>	S	*Bombay (M), + C. P. (G), Orissa (G), U. P. (M).	*Fruits also. +For goats.

Besides the above, leaves and young shoots of bamboos in general are lopped for fodder for cattle and elephants.

STATEMENT II.—Medium Fodder Species.

Species (arranged alphabetically).	Tree, shrub or climber.	Provinces in which used, with local classification.	Remarks.
1	2	3	4
<i>Aesculus catechu</i>	T	*Bombay (G/M), Orissa (M), Punjab (M/P), U. P. (M).	*Specially for goats and sheep.
<i>A. ferruginea</i>	T	Bombay (U), C. P. (M).	Ditto.
<i>A. leucophloea</i>	T (thorny).	*Bombay (M), *C. P. (M), U. P. (G).	*Specially for goats and sheep; (poor also).
<i>Acer oblongum</i>	T	N. W. F. (G), U. P. (M).	
<i>A. pictum</i>	T	U. P. (M).	
<i>A. villatum</i>	T	U. P. (M).	
<i>Adina cordifolia</i>	T	Bombay (P), C. P. (M), U. P. (M).	
<i>Albizia lebbek</i>	T	Assam (P), Bombay (M), C. P. (G), Madras (U), Punjab (M/P), U. P. (M).	
<i>A. odoratissima</i>	T	Bombay (M), C. P. (G), Orissa (M), U. P. (M).	
<i>A. procera</i>	T	Bombay (M), Orissa (G), Punjab (M/P), U. P. (M).	
<i>Anogeissus latifolia</i>	T	Bombay (G/M), C. P. (M), Madras (U), Punjab (G), Orissa (P), U. P. (M).	
<i>Anthocephalus cadamba</i>	T	Assam (M), Bombay (U).	
<i>Antidesma diandrum</i>	S/t	*Bengal (M), U. P. (G), Orissa (U).	*Plains and Lower hills.
<i>Artocarpus lakoocha</i>	T	Assam (M), *Bengal (G), Bihar (U).	Ditto.
<i>Azadirachta indica</i> (Syn. <i>Melia azadirachta</i> , <i>M.</i> <i>indica</i>).	T	*Bombay (M/P), Madras (U), C. P. (G), U. P. (G/M).	*Specially for camels, goats and sheep.
<i>Bauhinia purpurea</i>	T	Assam (G), *Bengal (M), +Bombay (U), C. P. (M), Orissa (G), Punjab (M/P).	*Plains and L. hills. +Flowers and fruits also.
<i>B. racemosa</i>	t	Bombay (G/M), C. P. (G), U. P. (M), Orissa (U).	
<i>B. retusa</i>	t	C. P. (M), U. P. (G).	
<i>B. vahili</i>	C	Bombay (U), Punjab (M/P), U. P. (G).	
<i>Berberis spp.</i>	S	N. W. F. (M)	For goats.
<i>Betula alnoides</i>	T	Punjab (M/P), U. P. (M).	Specially for goats.
<i>B. utilis</i>	T	Punjab (M/P), U. P. (M).	Ditto.
<i>Bischofia javanica</i>	T	U. P. (M).	
<i>Boehmeria rugulosa</i>	t	U. P. (M).	
<i>Bombax malabaricum</i>	T	Assam (M), Bombay (G/P), C. P. (G), Punjab (M/P), U. P. (M).	
<i>Bridelia retusa</i>	T	Assam (G), Bombay (M), C. P. (M), Orissa (M), U. P. (G).	
<i>B. verrucosa</i>	S/t	C. P. (M).	
<i>Buchananian lantzani</i> (Syn. <i>B. latifolia</i>).	T	*Bombay (U), C. P. (M), Orissa (M), U. P. (G).	*Specially for buffaloes.

1	2	3	4
<i>Butea frondosa</i> . . .	t	Assam (G), *Bombay (P), C. P. (P), Punjab (G), U. P. (M), Orissa (U), Punjab (M).	*Specially for buffaloes.
<i>Capparis aphylla</i> . . .	S		Specially for goats, sheep and camels.
<i>Carallia integerrima</i> . . .	T	Assam (M).	
<i>Careya arborea</i> . . .	T	*Bombay (P), C. P. (M), U. P. (M).	*Fruits in particular.
<i>Carissa</i> spp.	S (thorny)	C. P. (M)	Specially for goats.
<i>Carpinus viminalis</i> . . .	T	Punjab (M/P), U. P. (M)	Ditto.
<i>Caryota urens</i> . . .	Palm	Orissa (M).	
<i>Cassia fistula</i> . . .	T	Assam (M), *Bombay (G), C. P. (P), Orissa (P), U. P. (M/P).	*Pods also.
<i>Castanopsis tribuloides</i> . . .	T	U. P. (M).	
<i>Colustrus songalensis</i> . . .	S	U. P. (M).	
<i>Celtis australis</i> . . .	T	Assam (P), Punjab (M/P), U. P. (G).	
<i>C. tetrandra</i> . . .	T	*Bengal (M), U. P. (G)	*L. hill forests and valleys.
<i>Cordia vestita</i> . . .	T	U. P. (M).	
<i>Cornus oblonga</i> . . .	t	U. P. (M).	
<i>Corylus colurna</i> . . .	T	Punjab (M/P), U. P. (M).	
<i>Crataeva religiosa</i> . . .	T	U. P. (M).	
<i>Cryptolepis buchanani</i> . . .	C/S	C. P. (M).	
<i>Dalbergia sericea</i> . . .	t	U. P. (M).	
<i>Dalbergia sissoo</i> . . .	T	Assam (G), Bombay (U), C. P. (G), Punjab (M/P), U. P. (P).	For camels in dry zones
<i>Dobregesia hypoleuca</i> . . .	S	U. P. (G/M).	
<i>Dichrostachys cinerea</i> . . .	S/t	Bombay (M)	Pods also.
<i>Dillenia pentagyna</i> . . .	T	Assam (P), Bombay (G).	
<i>Dolichandrone falcata</i> . . .	T	Bombay (M), C. P. (M).	
<i>Emblina officinalis</i> (Syn. <i>Phyllanthus emblica</i>).	T	*Bombay (U), C. P. (M), Punjab (M/P), U. P. (M).	*Fruits also.
<i>Enterolobium</i> (Syn. <i>Pithecolobium</i>) saman.	T	Bombay (M).	
<i>Erythrina indica</i> . . .	T	Assam (P), Bombay (G/M).	
<i>Ficus arnottiana</i> . . .	S/t	Bombay (U).	
<i>F. benjamina</i> . . .	T	*Bengal (G), Bombay (M), C. P. (G), Orissa (M), Punjab (M/P), U. P. (M).	*Plains and L. hills.
<i>F. retusa</i> . . .	T	Assam (P), Bombay (M/P), Orissa (G).	
<i>F. roxburghii</i> . . .	T	Assam (P), *Bengal (G), U. P. (M).	*Hill forests.
<i>F. tomentosa</i> . . .	T	U. P. (M).	
<i>F. tsiola</i> . . .	T	Bombay (M).	
<i>Flacourtia ramontohi</i> . . .	t (thorny)	Bombay (U), C. P. (G), Punjab (M/P), U. P. (M), Orissa (U).	
<i>Gardenia gumifera</i> . . .	S	Madras (U), Orissa (M).	
<i>G. latifolia</i> . . .	t	Bombay (U), C. P. (M).	
<i>G. lucida</i> . . .	t	C. P. (M).	
<i>G. turgida</i> . . .	t	Bombay (G/M), U. P. (P), U. P. (M).	
<i>Garuga pinnata</i> . . .	T	*Bengal (G), Bombay (M/P), C. P. (G), Orissa (P), Punjab (M/P), U. P. (M).	*Terni, Duars and L. hills.
<i>Gnetum scandens</i> . . .	G	Bombay (M).	
<i>Grewia disperma</i> (Syn. <i>G. laevigata</i>).	t	*Bombay (U), U. P. (M)	*For buffaloes.
<i>G. hainiana</i> . . .	t	U. P. (M).	
<i>Hedera helix</i> . . .	G	N. W. F. (M)	For goats, buffaloes and cows.
<i>Helicteres isora</i> . . .	S	Bombay (M/P), Orissa (G).	
<i>Heteropanax fragrans</i> . . .	t	Assam (M).	
<i>Holopternis rhacodes</i> . . .	C/S	Bombay (U), U. P. (M).	
<i>Hymenodictyon excelsum</i> . . .	T	Assam (M), Bombay (U), U. P. (M).	
<i>Indigofera gerardinna</i> . . .	S	U. P. (M).	
<i>Jasminum arborescens</i> . . .	S	Bombay (M).	

1	2	3	4
<i>Kydia calycina</i> . . .	t	Assam (G), *Bombay (M), C. P. (G), Punjab (M/P), U. P. (M).	* For buffaloes.
<i>Lagerstroemia parviflora</i>	T	*Bombay (M), C. P. (M), Orissa (M), U. P. (P).	* For buffaloes.
<i>Litsaea polyantha</i> . . .	T	Assam (M), *Bengal (G), U. P. (M).	* Plains and L. hills.
<i>L. sebifera</i>	T	Assam (G), Orissa (M), U. P. (M).	
<i>Loranthus longiflorus</i> . .	S (parasitic)	C. P. (M).	
<i>Machilus bombycina</i> . . .	T	Assam (M).	
<i>M. duthiei</i>	T	U. P. (M).	
<i>M. gambleri</i>	T	Assam (G), U. P. (M).	
<i>M. odoratissima</i>	T	*Bengal (M), Punjab (M/P), U. P. (M).	* Hill forests.
<i>Melilotus albus</i>	T	Bengal (M).	
<i>Mangifera indica</i>	T	Bombay (G/P), C. P. (M), Orissa (P), U. P. (M).	Plains and L. hills.
<i>Markea begoniaefolia</i> . .	t	Assam (M).	
<i>Meliosma dillenianefolia</i> .	t	*Bengal (G), Punjab (M/P)	* Hill forests.
<i>M. wallichii</i>	T	Bengal (M)	Ditto.
<i>Milusa volutina</i>	T	U. P. (M).	
<i>Mimusops elengi</i>	T	Bombay (M).	
<i>Mitragyna parvifolia</i> (Syn. <i>Strophogynoparvifolia</i>).	T	Assam (P), Bombay (M/P), C. P. (M), U. P. (G/P).	
<i>Myrsine semiserrata</i> . . .	S/t	U. P. (M).	
<i>Olea glandulifera</i>	T	Punjab (M/P), U. P. (M).	
<i>Phoebe lanceolata</i>	t	U. P. (M).	
<i>Phoenix aculeis</i>	Palm	Orissa (M).	
<i>Pistacia integerrima</i> . . .	T	Punjab (M/P), U. P. (M).	
<i>Pouzolzia vuminea</i>	S	Bengal (M)	
<i>Prosopis spicihora</i>	T (thorny)	*Bombay (U), C. P. (M), Punjab (M/P), U. P. (M).	Terai and L. hills. * Also pods for goats and sheep.
<i>Prunus cornuoides</i>	T	U. P. (M).	
<i>P. padus</i>	T	Punjab (M/P), U. P. (M).	
<i>P. undulata</i>	t	U. P. (M).	
<i>Quercus glauca</i>	T	N. W. F. (U), U. P. (M).	
<i>Randia dumetorum</i>	S/t	Assam (G), Bombay (P), U. P. (M).	
<i>Rhododendron campanulatum</i> .	S	U. P. (M).	
<i>Rubia cordifolia</i>	C	Assam (M).	
<i>Salix tetrasperma</i>	T	Assam (G), *Bombay (U), Punjab (M/P), U. P. (P).	* For goats and sheep.
<i>S. wallichiana</i>	t	U. P. (M)	For goats and sheep.
<i>Salvadora obooides</i>	S/t	*Bombay (U), Punjab (M/P)	* For camels and goats also fruits in parti- cular.
<i>Santalum album</i>	t	Bombay (M).	
<i>Sapium insignis</i>	T	U. P. (M).	
<i>Saurauja nopalensis</i>	t	*Bengal (G), U. P. (M)	* Hill forests.
<i>Schreberia swietonioides</i> . .	T	C. P. (G), Orissa (P).	
<i>Somnecarpus anacardium</i> . .	T	Orissa (U), U. P. (M).	
<i>Shorea robusta</i>	T	C. P. (M), Orissa (M), U. P. (P).	
<i>Sophora mollis</i>	S	Punjab (M/P), U. P. (M).	
<i>Sorbus foliolosa</i>	S/t	Bengal (M)	Hill forests.
<i>Soymdia fobrifuga</i>	T	Bombay (G/M), C. P. (M).	
<i>Spondias mangifera</i>	T	Assam (M), Bombay (P), C. P. (M), Punjab (M/P), U. P. (P).	
<i>Stychnos nuxvomica</i>	T	Orissa (M).	
<i>Symplocos orataegoides</i> . .	S/t	Punjab (M/P), U. P. (M).	
<i>S. racemosa</i>	t	U. P. (M).	
<i>Tamarix dioica</i>	S	Punjab (M/P), U. P. (M).	
<i>Terminalia arjuna</i>	T	Bombay (U), C. P. (M), U. P. (M).	
<i>T. bolerica</i>	T	Assam (G), Bombay (U), C. P. (M), Orissa (U), Punjab (M/P), U. P. (M).	

1	2	3	4
<i>T. chebula</i> . . .	T	Assam (G), Bombay (U), Orissa (U), U. P. (M).	
<i>Trema orientalis</i> . . .	t	Assam (G), * Bengal (M), Bombay (M/P).	* Terai, Duars and L. hills.
<i>Turpinia pomifera</i> (Syn. <i>T. nepalensis</i>).	T	Assam (M), * Bengal (G/M)	* Ditto.
<i>Vitex negundo</i> . . .	S	C. P. (M).	
<i>Woodfordia floribunda</i> (Syn. <i>fruticosa</i>).	S	Bombay (M), U. P. (M). Orissa (U).	
<i>Wrightia tinctoria</i> . . .	t	Bombay (G), C. P. (P).	
<i>W. tomentosa</i> . . .	t	C. P. (P), U. P. (G).	
<i>Zizyphus oenoplia</i> . . .	C/S	* C. P. (M), U. P. (M)	* For goats.
<i>Z. rugosa</i> . . .	S/t	Assam (M), * Bombay (U), C. P. (M).	* Ditto.

12. STATEMENT III.—Poor (or Unclassified) Fodder Species.

Species (arranged alphabetically).	Tree, shrub or climber.	Provinces in which used, with local classification.	Remarks.
1	2	3	4
<i>Abutilon</i> spp. . . .	S	Punjab (M/P).	
<i>Acacia farnesiana</i> . . .	S (thorny)	Punjab (M/P), Orissa (U).	
<i>A. intsia</i>	C	Bombay (U)	Specially for goats and sheep.
<i>A. jacquemontii</i> . . .	S	Bombay (U)	Ditto.
<i>A. leucularis</i> . . .	t (thorny).	U. P. (P).	
<i>A. sumra</i>	T	Bombay (C)	Ditto.
<i>Acanthos. ilicifolius</i> .	S	Bombay (U)	Also for goats.
<i>Adhatoda vasica</i> . . .	S	Bombay (U).	
<i>Aegle marmelos</i> . . .	T	Bombay (U), C. P. (M), Orissa (P), U. P. (P).	
<i>Aesculus indica</i> . . .	T	N. W. F. (M/P), Punjab (M/P).	
<i>Ailanthus excelsa</i> . . .	T	Bombay (P), C. P. (P).	
<i>Alangium lamarekii</i> . . .	S/t	U. P. (P), Orissa (U).	
<i>Albizia annua</i> . . .	T	Bombay (M/P), Madras (U).	
<i>A. stipulata</i>	T	Bombay (U), U. P. (P).	
<i>Alnus nitida</i>	T	Punjab (M/P).	
<i>Argyrea speciosa</i> . . .	C	Bombay (U).	
<i>Atalutia monophylla</i> . .	S/t	Madras (U).	
<i>Balanite. roxburghii</i> . .	t	Bombay (U), C. P. (P).	
<i>Berberis aristata</i> . . .	S	Punjab (M/P).	
<i>B. lycium</i>	S	Punjab (M/P).	
<i>Boswellia serrata</i> . . .	T	* Bombay (M/P), C. P. (P)	* Specially for buffaloes.
<i>Buchlandia populnea</i> . .	T	Bengal (P)	Hill forests.
<i>Buddleia asiatica</i> . . .	S	Punjab (M/P).	
<i>Butea superba</i>	C	Bombay (C), Orissa (U).	
<i>Buxus wallichiana</i> . . .	t	Punjab (M/P), U. P. (P).	
<i>Calligonum polygonoides</i> .	S	Punjab (M/P).	
<i>Calotropis gigantea</i> . . .	S	Bombay (U)	Specially for goats.
<i>C. procera</i>	S	Bombay (U)	Ditto.
<i>Calycoptis floribunda</i> . .	C/S	Bombay (P).	
<i>Capparis sepiaria</i> . . .	C/S (thorny).	Punjab (M/P)	Ditto.
<i>Caragana hrovispina</i> . . .	S (thorny).	Punjab (M/P).	Ditto.
<i>Carissa opaca</i>	S (thorny).	Punjab (M/P), U. P. (P).	
<i>Carpinus faginea</i> . . .	T	Punjab (M/P).	
<i>Casearia tomentosa</i> . . .	t	Punjab (M/P), U. P. (P), Orissa (U).	
<i>Cedrela serrata</i>	T	N. W. F. (M/P), Punjab (M/P), U. P. (P).	
<i>C. toona</i>	T	Assam (M), * Bengal (P), Bom- bay (U), C. P. (G), Punjab (M/P), U. P. (P).	* Plains and L. hills.

1	2	3	4
<i>Celastrus paniculata</i> . . .	C	Bombay (U), Orissa (U).	
<i>Celtis orocarpa</i> . . .	T	Punjab (M/P).	
<i>Chloroxylon swietenia</i> . . .	T	C. P. (P)	
<i>Chickrasia tabularis</i> . . .	T	Bengal (P)	Plains & L. hills.
<i>Cipadessa fruticosa</i> . . .	S/t	Orissa (U)	
<i>Citrullus colocynthis</i> . . .	C	Bombay (U)	For buffaloes (fruits also).
<i>Clastanthus collinus</i> . . .	t	Orissa (U)	(C. P. reports that the leaves are poisonous).
<i>Clorodendron phlomidis</i> . . .	S	* Bombay (U)	*Specially for buffaloes.
<i>C. serratum</i> . . .	S	Bombay (U)	Ditto.
<i>Cocculus villosus</i> . . .	C	Bombay (U)	For buffaloes.
<i>Cochlospermum gossypium</i> . . .	t	Bombay (P)	Specially for buffaloes.
<i>Colebrookia oppositifolia</i> . . .	S	Bombay (U)	Ditto.
<i>Combretum decaandrum</i> . . .	C/S	C. P. (M), Orissa (U)	Ditto.
<i>C. ovalifolium</i> . . .	C/S	Bombay (U)	Ditto.
<i>Cordia macrodon</i> . . .	T	* Bombay (U), U. P. (M)	* Ditto.
<i>Coraria nepalensis</i> . . .	S	Punjab (M/P).	
<i>Cornus capitata</i> . . .	t	U. P. (P).	
<i>C. macrophylla</i> . . .	T	Punjab (M/P), U. P. (P).	
<i>Corylus colurna</i> . . .	T	N. W. F. (P)	For goats.
<i>Cotoneaster bacillaris</i> . . .	S/t	Punjab (M/P), N. W. F. (P)	Hill forests. Specially for goats and sheep.
<i>Cyclostemon asamicus</i> . . .	t	Assam (P).	
<i>Dalbergia pameolata</i> . . .	T	Orissa (P).	
<i>D. volubilis</i> . . .	C/S	Bombay (U).	
<i>Daphniphyllum</i> . . .	S	Punjab (M/P)	In dry zone of U. Pashahr. (Not eaten by sheep and goats).
<i>Desmodium cephalotes</i> . . .	S	Bombay (U).	
<i>D. tiliaefolium</i> . . .	S	Punjab (M/P)	Used very much in the Punjab hills.
<i>Deutzia</i> spp. . . .	S	Punjab (M/P).	
<i>Diospyros embryopteris</i> . . .	T	Bombay (U).	
<i>D. melanoxylon</i> . . .	T	Bombay (U), C. P. (P), Orissa (U).	
<i>D. montana</i> . . .	S/t	Bombay (U).	
<i>D. salivata</i> . . .	T	Orissa (U).	
<i>Diospyros tomentosa</i> . . .	T	U. P. (P).	
<i>Dryas volubilis</i> . . .	C	Bombay (U)	Specially for goats and sheep.
<i>Echinocarpus dactyloides</i> . . .	T	Bengal (M/P)	Hill forests.
<i>Ehretia laevis</i> . . .	T	Bombay (U), C. P. (P), U. P. (M).	
<i>Elaeagnus umbellata</i> . . .	S	Bombay (M/P).	
<i>Elaeodendron glaucum</i> . . .	(thorny). T	Bombay (U), C. P. (G), U. P. (P).	
<i>Embelin robusta</i> . . .	S	U. P. (P).	
<i>Eriobotrya</i> spp. . . .	t	Bengal (P)	Hill forests.
<i>Erythrina suberosa</i> . . .	T	Assam (P), Bombay (G), C. P. (P), U. P. (P).	
<i>Ficus hirsuta</i> . . .	S/t	Assam (P).	
<i>Ficus leucopyrus</i> . . .	S	Bombay (U)	Specially for goats and sheep.
<i>Glechidium elutinum</i> . . .	(thorny). t	U. P. (P).	
<i>Glycosmis pentaphylla</i> . . .	S	Orissa (U).	
<i>Gynandropsis emarginata</i> . . .	S/t	Bombay (P).	
<i>G. mantana</i> . . .	S	Bombay (P), C. P. (P).	
<i>G. royleana</i> . . .	S	Bombay (U).	
<i>Hamiltonia suaveolens</i> . . .	S	Bombay (U).	
<i>Hemicycla sepium</i> . . .	S	Madras (U).	
<i>Heterophragma roxburghii</i> . . .	T	Bombay (P).	
<i>Hibiscus</i> spp. . . .	S	Orissa (U).	
<i>Hiptage madablotia</i> . . .	C/S	Bombay (U), Punjab (M).	
<i>Holarrhena antidysenterica</i> . . .	t	Assam (P), Bombay (M), C. P. (P), Orissa (P).	
<i>Holoptelea integrifolia</i> . . .	T	Bombay (U), C. P. (P), U. P. (P).	
<i>Ilex diphyrena</i> . . .	t	Punjab (M/P)	For goats in all hill forests.

1	2	3	4
<i>Ixora parviflora</i> . . .	t	* Bombay (U), C. P. (P), Orissa (U).	* For buffaloes.
<i>Jasminum humile</i> . . .	S	Punjab (M/P).	
<i>Juglans regia</i> . . .	T	N. W. F. (M/P), Punjab (M/P).	
<i>Lagerstroemia flos-reginae</i> . . .	T	Bombay (U).	
<i>Lespedeza spp.</i> . . .	S	Punjab (M/P).	
<i>Litsea umbrosa</i> . . .	T	Punjab (M/P).	
<i>Machilus ganmicania</i> . . .	T	Bengal (P).	Hill forests.
<i>Mallotus philippinensis</i> . . .	t	Bombay (U), Punjab (M/P), U. P. (P).	
<i>Mimusops hexandra</i> . . .	T	Bombay (U)	For buffaloes.
<i>Monothea buxifolia</i> . . .	S/t (thorny).	Punjab (M/P).	
<i>Morinda citrifolia</i> . . .	S/t	Orissa (U).	
<i>M. exserta</i> (Syn. <i>M. tinctoria</i>). . .	t	Bombay (P), C. P. (M), Orissa (U).	
<i>Mussaenda glabra</i> . . .	C/S	Orissa (U).	
<i>Nyctanthus arborescens</i> . . .	t	C. P. (P), Punjab (M/P), U. P. (M).	
<i>Ochna squarrosa</i> . . .	S/t	* Bombay (U), Orissa (U)	* For buffaloes.
<i>Oroxylum indicum</i> . . .	t	* Bengal (P), Bombay (M), U. P. (P).	* Plains and L. hills.
<i>Ostodes paniculata</i> . . .	T	Bengal (P)	Hill forests.
<i>Parrotia jacquemontiana</i> . . .	S	N. W. F. (P)	For goats.
<i>Pavetta indica</i> (Var. <i>P. tomentosa</i>). . .	S	* Bombay (U), Orissa (U)	* For buffaloes.
<i>Phoenix sylvestris</i> . . .	Palm	C. P. (P).	
<i>Photinia integrifolia</i> . . .	t	Bengal (P)	Hill forests.
<i>Pieris ovalifolia</i> . . .	t	Punjab (M/P), U. P. (P).	
<i>Plectranthus rugosus</i> . . .	S	Punjab (M/P).	
<i>Pongamia glabra</i> . . .	T	* Bombay (P), C. P. (M)	Pods only.
<i>Populus euphratica</i> . . .	T	N. W. F. (M/P), Punjab (M/P).	
<i>Protona barbata</i> . . .	t	* Bengal (P), U. P. (M)	* Plains and L. hills.
<i>P. tomentosa</i> . . .	T	Orissa (U).	
<i>Prunosepia utilis</i> . . .	S (thorny).	Punjab (M/P).	
<i>Prosopis juliflora</i> . . .	T (thorny).	Bombay (U).	
<i>Prunus armeniaca</i> . . .	T	Punjab (M/P).	
<i>P. padua</i> . . .	T	N. W. F. (U)	For goats and buffaloes.
<i>P. puddam</i> . . .	T	U. P. (P).	
<i>Pterospermum acorifolium</i> . . .	T	Orissa (U).	
<i>Pterospermum suberifolium</i> . . .	T	Madras (U).	
<i>Pueraria tuberosa</i> . . .	C	Bombay (U).	
<i>Putranjiva roxburghii</i> . . .	T	Bombay (U), U. P. (P).	
<i>Pyrus pashia</i> . . .	T	Punjab (M/P), N. W. F. (U)	Only during autumn for sheep and goats.
<i>Randia uliginosa</i> . . .	t	Assam (M), Bombay (P), Orissa (P), U. P. (P).	
<i>Rhamnus dahuricus</i> (Syn. <i>R. virgatus</i>). . .	S/t	Punjab (M/P)	Hill forests, specially for sheep and goats.
<i>R. triquetra</i> . . .	S	U. P. (P).	
<i>Rhizophora mucronata</i> . . .	t	Bombay (U)	Berries also.
<i>Rhododendron arborum</i> . . .	t	U. P. (P), N. W. F. (U)	Hill forests, specially for sheep and goats.
<i>Rhus cotinus</i> . . .	S/t	Punjab (M/P), U. P. (P).	
<i>R. parviflora</i> . . .	S	Bombay (P).	
<i>Rosa moschata</i> . . .	C/S (thorny).	Punjab (M/P)	Ditto.
<i>Rubus biflorus</i> . . .	S (thorny).	Punjab (M/P).	
<i>R. lasiocarpus</i> . . .	S (thorny).	Punjab (M/P)	Ditto.
<i>Saccopetalum tomentosum</i> . . .	T	C. P. (P).	
<i>Salix</i> spp. . . .	T	N. W. F. (P)	For buffaloes, goats and cows.
<i>Salix elegans</i> . . .	S	Punjab (M/P)	Hill forest, for sheep, goats and cattle.

1	2	3	4
<i>Salsola footida</i> . . .	S	Punjab (M/P).	
<i>Sapindus detergens</i> . . .	t	Assam (P).	
<i>S. emarginatus</i> . . .	T	Madras (U).	
<i>Smilax</i> spp. . . .	C/S	Orissa (U).	
<i>Spiraea bella</i> . . .	S	Punjab (M/P).	
<i>S. canescens</i> . . .	S	Punjab (M/P)	Hill forests, specially for sheep and goats.
<i>S. sorbifolia</i> (Syn. <i>S. lindleyana</i>).	S	Punjab (M/P)	Ditto.
<i>Staphylea emodi</i> . . .	S	Punjab (M/P).	
<i>Storculia colorata</i> . . .	T	Bombay (U).	
<i>S. villosa</i> . . .	T	Bombay (U), U. P. (P).	
<i>Storosporum</i> Cbelo- noide.	T	* Bombay (P), C. P. (M)	* For buffaloes.
<i>Strobilanthes</i> spp. . .	S	Orissa (U), Punjab (U)	† Hill forests, specially for sheep and goats.
<i>S. callosus</i> . . .	S	Bombay (P)	
<i>S. sesuili</i> . . .	S	Bombay (P).	
<i>Suaeda fruticosa</i> . . .	S	Punjab (M/P).	
<i>Syringa emodi</i> . . .	S	Punjab (M/P), U. P. (P).	
<i>Tamarix articulata</i> . . .	T	Punjab (M/P).	
<i>Tamarix gallica</i> . . .	S/t	Punjab (M/P).	
<i>Taxus baccata</i> . . .	T	Punjab (M/P).	
<i>Tectona grandis</i> . . .	T	Bombay (P), C. P. (P).	
<i>Thespesia lampas</i> . . .	S	Bombay (U), Orissa (U).	
<i>Tinospora cordifolia</i> . . .	C	Bombay (P).	
<i>Trewia nudiflora</i> . . .	T	Assam (G), Bombay (U), U. P. (P).	
<i>Ulmus laevigata</i> . . .	T	Punjab (M/P)	Hill forests, specially for sheep and goats.
<i>U. villosa</i> . . .	T	N. W. I. (U).	
<i>Vangueria spinosa</i> . . .	t	Bombay (P).	
	(thorny).		
<i>Viburnum</i> spp. . .	S/t	Punjab (M/P).	
<i>Vitex leucocyon</i> (Syn. <i>V. glabrata</i>).	T	Bombay (U).	
<i>Xylia dolabriformis</i> . . .	T	Bombay (U)	For buffaloes.
<i>X. xylocarpa</i> . . .	T	Bombay (P).	
<i>Xylosma longifolium</i> . . .	T	Punjab (M/P).	
<i>Zanthoxylum alatum</i> . . .	S/t	Punjab (M/P)	

† (Used as fodder in winter after drying. Before the rains it is poisonous but not so after the rains).

FOREST RESEARCH INSTITUTE, DEHRA DUN.

INDIAN FOREST LEAFLET No. 27

(SILVICULTURE)

ABSTRACT.

This leaflet lists and briefly discusses the information available in the files and library of this office on some aspects of erosion control.

It was compiled in order to augment and help put into effect the resolution of the 1939 Silvicultural Conference on item No. 12 on the subject of erosion.

PREFACE.

In November 1939 the Fifth Silvicultural Conference held at the Forest Research Institute, Dehra Dun, passed the following as part of its resolution on item No. 12 "Erosion."

"Resolved that:—

1. The following subjects connected with erosion be more fully investigated than hitherto by the silviculturists concerned:—

(a) Effect of control of grazing.

(b) Improvement of grass lands by stocking with better grasses, and by a study of ecological conditions.

(c) Effect of contour trenching upon the ecological balance and upon rates of growth of trees and grasses.

(d) Effect of contour trenching and gully plugging upon run off and flood control.

(e) Suitable materials for check dams and gully plugging.

(f) Costing for contour trenching and gully plugging.

(g) Fodder trees.

(h) Maximum gradient up to which cultivation is possible.

2. Existing information should be collected and made available as early as possible."

In order to comply with this resolution and to enable information to be available to silviculturists so that the further work contemplated by the conference could be started, this leaflet has been prepared by Mr. Jagdamba Prasad the experimental assistant silviculturist.

It consists of a compilation of information available in the files and library of this office and should not be regarded as a complete bibliography of the subject. Various special points brought out by the literature under each of the subjects specified by the Silvicultural Conference are listed and very briefly discussed.

It does not attempt to deal with such a vast subject as erosion in general and it is primarily intended as an annotated list of selected literature on these particular aspects of the subject.

The country of origin of the information has been marginally noted against each paragraph.

A note on the fodder trees of India has already been issued.

Miscellaneous bulletin No. 28 (1930) of the I C A. R. by R. MacLagan Gorrie, "Bibliography of soil erosion," should be consulted for references to literature on the various aspects of erosion on which further information may be desired.

It has been a difficult compilation owing to the dispersed nature of the information. The literature is vast and generally of the popular type consisting largely of opinions, often without any precise large scale work or even small scale experimental backing. We shall be very grateful if readers will kindly point out errors and omissions for only by such help can we hope to get together a more comprehensive note on this most important subject.

A. L. GRIFFITH,
Silviculturist.

The 30th July 1942.

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NOTES ON SOME ASPECTS OF EROSION CONTROL.

BY

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1. Effect of control of grazing.

a. Adverse effects of overgrazing.

Greece and Africa.—Formation of deserts. When an excessive number of animals is maintained on an area for pasture the vegetation is gradually eaten bare and the consequent exposure and trampling, under climatic factors, result in the top soil being eventually reduced to dust, when it is blown or washed away. Once this condition has been set up, the ultimate result (longer in the case of forest covered country than in the case of grass-covered only) is the destruction of all vegetative covering and the production of a desert, or in the language of America, a "dust bowl." The last stage may be the appearance of the bare rock on the surface (85). Desert conditions may not be reached all at once, but through stages of varying degrees of soil erosion.

India—All the various stages from forest to desert can be seen in India, particularly in such parts as Sind, Baluchistan, the Punjab, the United Provinces and Bihar.

America.—Low rate of percolation. From a comparison made between the percolations of mineral forest soil, below the undecomposed litter, and that of similar soil, close at hand, under agricultural treatment, the percolation of the forest soil was found to be superior throughout. The superiority, however, diminished with increasing depth, as shown in the following statement:—

Depth in inches.	Percolation ratio forest soil/agricultural soil.
1	50
2	17
3	2.5

Less drastic treatments than agricultural operations have the same effect. AUREX's results show that grazing will bring the percolation rate of forest soils down almost to the level of agricultural land (13).

India.—This phenomenon has been noted in several provinces in India but precise measurements of its intensity have apparently not been made.

India.—Deterioration of fodder. Experience in the United Provinces has shown that when a closed area is reopened to unrestricted grazing reversion to the original worthless grasses, *Aristida hystrix* and *Aristida depressa*, and the almost complete disappearance of useful fodder grasses is very rapid (20).

India.—Widening of water-courses. In the Pabbi and Salt Range country of the Punjab can be witnessed typical conditions, where each small branch of a deep water course is cutting back rapidly into the unprotected slopes, from which persistent grazing has driven out all but the hardiest remnants of the previous scrub jungle cover (17).

Similar conditions can be seen in the ravine country of Etawah in the United Provinces.

India.—Increased velocity of run-off. In the Pabbi area of the Punjab, the flood discharges of the torrent crossing the canal at right angles, in respect of the run-off in cusecs per square mile of catchment area, were studied. The worst offenders with a peak of nearly 1600 cusecs were those draining the *gujar* grazing grounds of the north face. The figures for the south face varied directly with intensity of grazing. Those fairly well-protected averaged 600 to 700 cusecs, while those at the ends further from the forest range headquarters and carrying considerable grazing incidence either under a recognised lease or illicitly, showed about 1000 or 1100 cusecs (17).

As is discussed later, in the same type of area with long established afforestation and counter erosion works this maximum run-off can be less than 100 cusecs per square mile.

America.—Floods. Disastrous floods are commonly attributable, at least in part, to the depletion by overgrazing, fire or other causes of the vegetation on land where heavy rainfall occurs. The control of these floods is a major water shed problem. Several investigators, of forest and grazing land conditions in the mountain regions, among them Leiberg, Gorman, Langille, Plummer and Goswell and Rixon, have pointed out that overgrazing was evidently responsible for the denudation of the mountain slopes, for increased surface run-off and erosion of the soil and in some instances for the reduction of mountain slopes to barren wastes. Reynolds in 1910 made a study of the relation of grazing to floods and found evidence to support the theory that the partial denudation of the mountain slopes, as a result of destructive grazing practised on several watersheds between 1880 and 1902 was responsible for serious floods in the years 1888, 1889, 1893, 1896, 1901, 1906, 1908, 1909 and 1910. (14).

b. Benefits from closure to grazing.

America.—Economy of run-off. A study in Utah presents the results of 15 years' measurements of precipitation, surface run-off and erosion from summer rains and seven years measurements of melted snow run-off and erosion on two experimental watersheds, one 11,244 acres and the other 8,972 acres in extent. Summer run-off and erosion during six years on one of the watersheds when 10% of the surface was occupied by vegetation are compared with run-off and erosion on the same area during a later six year period, when the vegetation occupied 40% of the surface and with conditions on the second area where there was stable 40% cover. The average annual precipitation on the areas studied was 20.51 inches. Only 4.6% of the average annual surface run-off was caused by summer rain storms where there was a 10% cover of vegetation, but this run-off caused 84.5% of the erosion. The remainder of the run-off which was from melted snow, caused far less erosion. After the vegetation had increased to 40% of a complete cover only 1.3% of the annual run-off was from summer rains. The increase in the density of the vegetation from 10-40% of a complete cover and the replacement of certain plants by others with more extensive and fibrous root systems reduced the rainfall surface run off 64% and rainfall erosion 54%. It reduced melted snow erosion 57%, but did not influence melted snow run-off. (15). This increase in the density of the vegetation in the A area was entirely due to the control and closure of grazing.

Effect of natural cover (Manti National Forest.)

	Area A, originally 16 per cent. cover.		Area B, maintained, at 40 per cent. cover.		A/B ratio.	
	Run-off. per cent.	Sediment. c. ft.	Run-off. per cent.	Sediment. c. ft.	Run-off. per cent.	Sediment. c. ft.
Period of unequal cover	10.33	133.8	2.62	21.7	4.10	5.42
Period of equalization of cover	8.74	105.0	3.03	37.3	2.88	2.82
Period of equal cover	5.49	10.2	5.23	7.7	1.05	2.48

The experiment exaggerates the run-off on area A. It is stated that the A soil was much more favourable to run-off than the B soil. This therefore throws into higher relief the recovery of A during the reclamation period, until eventually the cover and not the soil permeability became the controlling factor. (13).

Switzerland and America.—The above experiment was an investigation into the effect of control of grazing on run-off and erosion and should not be confused with the classic experiments at Emmenthal and Wagon Wheel Gap. The Swiss experiment at Emmenthal (Bosser 1919 Investigations into the effect of forest on water courses) compared 2 valleys one of which was entirely wooded and the other was only one-third wooded. The American experiment at Wagon Wheel Gap, Colorado (Barns & Henry 1928 Forest and stream flow experiment at Wagon Wheel Gap, Colorado) was conducted on two valleys one of which was artificially completely denuded after 8 years of observations to establish comparability. At Emmenthal the erosion of the wooded valley was roughly $\frac{1}{3}$ of

that of the partly wooded valley and at Wagon Wheel Gap the denudation of the valley increased the erosion rate from 28 lbs. per acre per year to 16.7 lbs. per acre per year

India—The following statement shows the comparative effect of control measures in the Punjab —

Conditions	Maximum run-off,	Revenue.
Afforestation and counter erosion works in progress for about 50 years	Less than 100 cusecs per sq. mile.	One rupee per acre for grass cutting.
Protection against grazing, but no active afforestation or building of <i>bunds</i> (check dams) in water courses	600 cusecs per sq. mile.	
Partially but ineffectually controlled grazing	1,000 cusecs per sq. mile.	One anna per acre for grazing.
Persistent cattle and buffalo grazing (18).	1,600 cusecs per sq. mile.	

The above figures should be taken as representing general values but such conditions are not always typical

In the Tikiwala *las* in the Punjab (*Kas*=a torrent) *Kana grass* (*Saccharum munja*) is tending to spread in the beds of water-courses, showing that floods are less severe than they used to be. This is the result of a continued regime of protection against grazing, but with no active erosion control work. (17).

India.—*Most effective check on erosion*. It is found that by far the most effective check on erosion is the restriction of grazing, with complete closure where necessary, and this is an essential preliminary to all further efforts. More closure for a few years results in a natural cover of grass coming in, in most places, which is the first stage towards rehabilitation of the vegetative cover. (6)

Prevention of sheet erosion. Experience in the Hoshiarpur Sivaliks, Punjab, has shown that a light covering of trees and bushes is not sufficient to stop sheet erosion of soft sand rock. By closing the slopes to cattle and thereby allowing a crop of grass to spring up, it is believed that the object can be attained to a fair degree. The value of a good covering of grass in checking sheet erosion is well-known and the first step is to extend progressively a system of closure to cattle grazing to convert the hillsides into a large fodder reserve. (15).

India.—*Increased revenue*.—In the Pabbi tract the reclamation area of about 3,000 acres yielded a revenue of a rupee per acre for grass cutting as compared with a grazing revenue of one and a half annas per acre for adjoining land open to grazing; this revenue from cut grass is from areas ploughed or trenched anything up to 16 years before. (17).

General improvement. In the Punjab until 1935 destruction outpaced reclamation, but now, where closures have been applied, recovery of the vegetative cover has been rapid, erosion has been greatly reduced and the villages have greatly benefited by the sales of *Eulaliopsis binata* and other grasses from the closed areas. (19).

c. Importance of controlled grazing.

America—On grassland, controlled grazing is of the very highest importance in order that a vicious circle of processes conducive to erosion shall not develop. Bennett and Chapline rightly emphasize the cumulative effect of over-grazing. The destruction of cover leads to greater run-off and diminution of soil moisture reserves, which in turn lead to further depletion of cover. As a result of over-grazing, the tendency to increased destruction of cover in search of adequate food for cattle becomes intensified and the pulverisation of the inadequately protected top soil produces a layer of loose dust that is washed away by the first rains, thus exposing a new layer for further desiccation and erosion. (13).

d. What is controlled grazing?

India.—Controlled grazing should consist in:

- (1) restriction of numbers to the limit of grazing possibility,
- (2) rotational grazing to provide short periods of rest for portions of the area and sometimes to allow seeding of good fodder grasses—the need of their artificial

production is not a necessity, but would be a help, (periodic grazing in which long periods of rest alternate with comparatively long periods of grazing is another form of control sometimes adopted),

(3) setting apart areas for grass cutting to tide over the long dry season, and

(4) effective control of goat grazing by its greater restriction wherever any attempt is made to produce shade trees and its exclusion altogether from hill slopes. (23).

e. *Beneficial effects of controlled grazing*

Africa.—*General improvement.* The value of a rotation of grazing lies in the fact that it is the trampling of animals in search of food and water, and not the actual grazing down, that causes erosion. In other words, the hoof is worse than the mouth. (5).

This is another phenomenon that has been observed many times, in many provinces of India.

India.—In the Punjab, the Chos Act restricting grazing above a certain demarcated line was introduced in 1902, with such great benefit in the Hoshiarpur division that certain of its provisions were extended. (19)

Experiments carried out by the forest department during 25 years in the Jumna and Chambal ravines and elsewhere have proved conclusively that control of grazing alone is sufficient to bring back the natural vegetation and check further erosion. (33).

Two experiments on rotational grazing, in connection with the improvement of grazing areas, were carried out in forest pastures near Poona. The conclusions were:

(1) Restriction of grazing to limited areas enables intensive grazing and avoids waste. A period of rest is also provided by turns to parts of the grazing area.

(2) In forest grasslands, controlled grazing protects the seedlings of forest trees from damage by cattle.

(3) Soil erosion and denudation of land are effectively prevented.

(4) Controlled grazing increases the yield of grasses. (25).

America.—*Flood control.* REXFORD's studies showed that when grazing was greatly curtailed in the late nineties and carefully controlled since on the Manti canyon watershed, heavy rainstorms in August 1909 caused severe floods in the adjacent canyons to both the north and south of the Manti canyon, while the latter was not perceptibly affected. Since 1909 no flood of any consequence has occurred in the Manti canyon, although badly depleted portions of adjacent water-sheds have had several bad floods. (14).

Improvement of fodder. Experience in the United Provinces has shown that where closure is applied to any ravine area or when the grazing is controlled, the more valuable grasses oust *Aristida hystrix* and *A. depressa*, both of which are practically worthless and spread rapidly as a rule. Controlled grazing or closure to grazing has produced excellent fodder reserves. (29).

India.—In the scheme for checking erosion in the Hoshiarpur Siwaliks, closure to grazing with the object of encouraging grass growth is considered the most important item.

India.—GARLAND describes an area at Poona on the tension belt between thorn scrub and mixed deciduous forest with a rainfall of 24 inches, that after closure for 40 years had only produced very inferior grasses and a few scrub trees, but by dividing a 40 acre area into 4 paddocks, grazing each as closely as possible before moving the cattle into the next, it was possible, after 5 years, to maintain 20 cows on the area throughout the year. Good grasses had replaced the inferior ones and in spite of the very heavy grazing, natural tree regeneration had begun and erosion had been checked. The land was in a condition in which it could be utilised at will either for forest or pasture purposes. (19).

This observation though admittedly an extreme case in a type not typical of India's general erosion problem areas demonstrates that strict control of

grazing is essential. The most efficient erosion control measures do not necessarily imply the complete stoppage of grazing.

Stoppage of soil erosion Strictly controlled grazing has also been enough to attain the object of stopping soil erosion in ravines and their extensions in certain areas. In such places it is often the grasses that really matter as a preventive of surface run-off of rain water and therefore of soil erosion. Observation has shown that wherever there is a thick crop of grasses sometimes irrespective of the presence of shrubs or trees no fresh erosion is visible in such areas, while fresh erosion and slips are quite common in the unprotected areas, where the ground is bare of grasses (29).

2. Improvement of grasslands by stocking with better grasses and by a study of ecological conditions.

India—Although improvement in respect of the fodder value of grasses is commonly the ideal, there may be instances where on account of ecological conditions and other factors non-fodder species of economic value may prove to be the most suitable for a locality, e.g., *Eulaliopsis binata* and *Saccharum munja*.

A profitable *Eulaliopsis binata* farm can economically be established on poor quality *Shorea robusta* bearing forest, with a soil derived from shale with intercalated zones of quartzite, and an annual yield of 25 maunds per acre can safely be expected after 3 years of planting. This grass is very efficient in preventing erosion (3).

India.—In Hoshiarpur the soil and climate (rainfall 28 inches) are such that a canopied forest can only be obtained in the bottoms of ravines; for the rest, partly owing to the great demand for grass by the local inhabitants, the policy is to clothe the hills with grass and an open canopy of trees and bushes, the most unfavourable localities being left entirely under grass, and grasses are being sown where necessary, the species being:—

- (1) *Heteropogon contortus*.
- (2) *Chrysopogon montanus*.
- (3) *Eulaliopsis binata*.
- (4) *Cenchrus ciliaris*.

Saccharum munja is a good grass to sow on sandy slopes and in the bottom of sandy ravines, where tufts can also be planted during the rains.

Africa.—*Kudzu* (*Pueraria thumbergiana*) is a creeping leguminous plant which not only checks the flow of water and filters out the silt, but binds the earth and at the same time gathers nitrogen. (22).

America—The *Kudzu* vine is an oriental plant imported from China and Japan. It is a prolific grower. Individual vines frequently attain a length of more than 30 feet in one season. It is however a climber and should not be planted with trees unless left rigidly under control. Its vines running on the ground will take root at the leaf joints that produce numerous vines the following year just as the parent vine did. Runners from settings should not be permitted to run in just any direction the first year, but should be lifted and placed so as to cover the most ground. Every third or fourth leaf joint should be covered with soil late in June, in July and early August, so as to hold moisture sufficiently for it to take root.

The vine yields an abundance of nourishing food for stock. Its protein content is claimed to be equal to that of alfalfa. It can be propagated for settings either by covering the leaf joints as described, or by sowing seed in the spring in prepared beds or single rows and cultivating the sprouts during the summer. The seeds should be sown sparingly so that vines can run freely, and their leaf joints can be rooted to form settings.

The *Kudzu* may be planted in the spring from root crowns one to two years old and spaced from 4 to 12 feet apart. It should be set in well made holes, that will enable it to develop good thrifty vines the first year. (9).

India.—It is a common cover crop in the rubber estates of South India and has also been tried in teak plantations as a weed suppressor.

From the point of erosion-resisting qualities the following gradation of crops has been evolved:—

- (1) Bermuda grass (*Cynodon dactylon*).
- (2) Lespedeza grass (*L. sericea*, *L. striata*, *L. stipulata*).
- (3) Clovers (*Trifolium* spp.).
- (4) Cow peas (*Vigna sinensis*). } Leguminous fodder.
- (5) Alfalfa grass (*Medicago sativa*). (31).

Africa.—*Kikuyu* (*Pennisetum clandestinum*) is an exotic grass of value.

Although an average rainfall of 15 inches in the Somerset East district of South Africa is too small, the establishment of *Kikuyu* grass was due to fertile alluvial soil in the watercourse. It rooted readily and spread rapidly and was able to bind the soil. It affords valuable grazing with a carrying capacity of almost ten times as high as that of natural grazing. (29), it has been introduced with success in several forest areas of S. India.

India.—*General*.—Other soil-binding plants are: the trumpet creeper *Bignonia radicans*, the weed *Ipomea biloba* and the grass *Andropogon pertusus* (11). *Festuca pumila* is an Italian grass that can render great service in fixing steep slopes.

America.—HOLT and TROXALL question the generally accepted view that complete afforestation is the best way of preserving constancy of water supply. They found in some cases that the subsequent stage, when a new scrub association had developed over the denuded area, had more beneficial effects on water supply than untouched forest, since, without increase in erosion, there was an increase in summer run-off, an increase in average summer minimum and a considerably shorter low water period. These investigations merit further attention. If erosion can be satisfactorily prevented and at the same time the water supply can be enhanced without complete forest great saving in money may be expected in dry basins where water shortage is becoming critical. (18):

India.—The general question of the introduction of exotic grasses is discussed by BOR (1941) in Indian Forest Records (new series) (*Botany*) 2 (1) Common grasses of the United Provinces and (1939) 1 (4) A sketch of the vegetation of the Aka Hills, Assam. These publications also describe a large number of useful common Indian grasses.

The author concludes that "The conditions which suit an exotic are very unlikely to be those which suit the indigenous species. The indigenous species, because it is indigenous, can and actually does, eject the exotic species when both are in active competition under the same conditions. If however the exotic is weeded and assisted by the hand of MAN it can maintain itself and give heavy yields. This process is however a kind of gardening and the forest officer must be prepared to pay the price."

3. Effects of contour trenching upon the ecological balance and upon rates of growth of trees and grasses.

America.—Trenched contour-terraces are intended to create favourable moisture conditions in the soil to hasten the restoration of the plant cover which otherwise might be too slow to meet the control problem. (10).

India.—In the Pabbi hills the best indigenous grass *Eleusine flag ellifera* persists much longer on the windrows of contour trenches and under a light tree shade. Improved grass crops can only be produced in the climatic conditions of the Pabbi under a regime of fairly deep contour trenches and partial afforestation. (17).

This aspect of the effect of contour trenching has been largely neglected. Much has been written about it and many opinions expressed but very little of the work done has acceptable scientific backing.

4. Effect of contour trenching and gully plugging upon run-off and flood control.

America.—A standard contour trench with cut and fill slopes not steeper than 1½ : 1 is designed to have sufficient capacity to hold 75 per cent of the run-off from a 2 inches storm. (10).

India.—An inspection by Lushington in the Bellary district of Madras revealed that in one place a small marsh had been formed by the *bunds* (dams) built across streams. In four other places the water held back by the *bund* had sunk into the soil and was trickling out lower down in the form of a spring. (5).

The downstream side of an earth *bund* in the Pabbi reclamation area was examined. The *bund* was well-revetted with a mass of tree roots and practically no water passed below, as could be seen from the grassy channel in the fire-ground. Comparative figures for *nalas* (water courses) draining from the reclamation area showed a run-off which seldom exceeds 100 cusecs per square mile, even in very heavy storms, while in the sandy outflow channels where the streams reach the lower more level ground, a considerable area of cultivation has been reclaimed from waste. The striking point about the reclaimed fields is that they remain in cultivation close up to the edge of a very narrow stream bed, whereas the unreclaimed torrent outflows have anything up to half a mile width left uncultivated owing to the danger and damage of their sudden flood peaks. This in itself demonstrates the advantage of controlled run-off and would justify a considerable outlay on reclamation work in the hilly catchments of all these torrents. (17)

There is a striking effect on the catchment of the rainfall. In untreated areas the maximum penetration is only ten inches; in worked areas the soil after a year shows moisture down to five feet and after two or three years when vegetation has been established, the water penetration increases up to ten feet. After two years practically no water escapes the lowest *bunds*. (32).

The following comparative statement is instructive:—

Run-off in cubic feet per second per square mile.

AMERICA.		PUNJAB.	
	Cusecs		Cusecs
Hilly timber 10-30% slope . . .	300	Terraced rice fields . . .	60
Hilly pasture	620	Foothills afforested and with soil-catchung dams	120
Hilly cultivated	1040	Foothills scrub forest closed to grazing	700
		Do. open to grazing	1100
		Do. disforested and heavily grazed	1600

5. Suitable materials for check dams and gully plugging.

Check dams.

America.—Check dams can be used to prevent further cutting of the gullies or as soil-saving dams to cause the gullies to fill up. (4).

India.—In the Pabbi reclamation area check dams of loose stones were built, also *bunds* of earth (originally 12 feet high, but completely silted up in course of time). (17). *Bunds* of sand raked up from the torrent are made, pitched with sand bags on the stream side. The sand-bags rot after a year and in some cases even before that, due to floods of great intensity. Stone-pitching to strengthen vulnerable points is suggested, but is more costly. (24).

The construction of large masonry *bunds* to store up water for keeping the soil moist does not justify the expense involved. However, small earth dams made at the heads of ravines to stop surface run-off of rain water are useful in preventing soil erosion and in silting up the shallow newly formed ravines. (29).

If the ravines are not large, brushwood *bunds*, firmly pegged across the bottom of the ravine may be sufficient; the work should start near the head.

America.—Substantial checks of creosoted planks, masonry or concrete are built where it is necessary to rely upon those alone for permanent or semi-permanent control. Earth dams with drop inlet culverts are generally resorted to when both the gully to be reclaimed and its watershed are large. Although brush dams are the least permanent of all types, are tedious to build and are very difficult to render and keep even partially watertight, they are nevertheless recommended because of the nominal cash outlay required and because they can be made to function by giving almost constant attention to maintenance. Woven-wire dams may be (1) V-type checks in V-shape gullies, (2) suspended

net type and (3) fixed basket type. Where stones or rocks of appreciable size and satisfactory quality are available, they may be used as barriers in medium sized gullies if the drainage is not too large, say 5 to 10 acres. If the watershed is too large or the rocks too small or if there is any other reason to doubt the holding power of the structure, the rocks should be set in cement mortar or enveloped in a cage of woven-wire. Where timber is plentiful or where a large number of logs 4 inches or more in diameter have accumulated as remnants in the construction of brush dams, or where, as in parks, the aesthetic value of rustic structures is important, log dams fit in very nicely. Plank check dams are seldom wanted for gully control on agricultural land, but they are ideally adopted in modified form for terrace outlet ditch protection. Either plain or creosoted planks may be used. They are of widespread use in the control of side ditches along highways. Permanent or soil-saving dams frequently serve watersheds much larger than 30 acres. In areas where stone or rock of good quality abounds, the rubble masonry dam is used for drops up to 10 feet. Where suitable stone or rock is not available concrete dams are built. Earth dams are built where the terrain is such, that the influence of the dam will extend over an appreciable area and for a considerable distance upstream. The best site for the dam is at a narrow neck with high banks where foundation conditions are good. (9).

Gully plugging

America.—Gully-head plugs are structures designed to halt the upstream progress of gullies by reducing the grade at the top of a slope, which when paved or protected, will allow the drainage to get from the upper to the lower level without further erosion. (4).

Should the cause of the gully be accidental or adventitious such as having started from a cart rut or cattle path, it may safely be filled with straw or brush and the sides ploughed in. (4).

Where the gully is small—2 or 3 feet deep—with no well-defined drainage area, it may be filled with straw, farm vegetable rubbish, cornstalks etc. and then the sides of the gully ploughed in. In grazing country the area should be contour furrowed and seeded to a suitable grass. (12).

Small gullies are sometimes reclaimed by the use of drain tiles laid throughout their length and the sides ploughed in. This is a very effective method, but is relatively expensive. (9).

Gully-head plugs and check dams can be made from various materials including brush, logs, wire, corrugated galvanised sheet metal, rocks, masonry, and concrete or combinations of them. The material selected should be that which will give a satisfactory structure at the least total cost for labour, materials and maintenance during its necessary life. (4).

Rock should be used in the construction of gully-plugs, if available. It is considered superior to brush for the purpose, due to greater ease and permanency of construction. Brush can be used in the construction of a gully-head plugging, if no rock is available. It should be accompanied also with a check a few feet below. This brush construction should be considered temporary in nature, unless a heavy growth of vegetation returns to protect the slope. It may, thus, require maintenance from year to year, dependent upon the kind of brush used and the conditions to which it is subjected. (4).

6. Costs of contour trenching and gully plugging.

India.—Contour trenching near Khed, Poona division, where the hillside was badly eroded and consisted of boulders and *murum* cost Rs. 3.8/- per hundred running feet to dig and build. The average horizontal spacing was 24 feet except near the top. At Nagaon near Dhulin, West Khandesh (average horizontal spacing 17 feet with 9 to 10 feet near the top) contour trenching cost Rs. 1.8/- per hundred running feet. (7). With an average of about 2000 feet per acre (30) of trenching the cost will amount to Rs. 70/- to Rs. 30/- per acre.

The following general rates were sanctioned in the afforestation division, United Provinces:—

Making ridges (2' wide x 1' high) and ditches (1' deep and 1' wide) on unploughed land steep slopes etc., including a little cliff breaking and breaking down bumps, pinnacles etc.....Rs. 20/- to 24/- per acre. (32).

Afforestation work was however closed in this division about the year 1930 and the rates given by SWINBURNE in bulletin No. 7 (8) were therefore not revised. Afforestation is being done along the canal banks in the division at the present time. Although the soil and other conditions are not throughout the same along the canals as in the ravines near Etawah, the work is of a similar nature. The rates prevalent for works in the canal plantations are given below. There has been a small rise of about 25% on all these rates due to abnormal war conditions.

I Soil preparation.—

(1) Ploughing on flat or undulating ground Rs. 4/- to 5/- per acre.

(2) Making field ridges 5' x 2' x 0' (10' x 10' apart) Rs. 5/- to 6/- per acre.

Making ditch ridges 6' x 2' x 1' (10' x 10' apart) Rs. 6/- to 7/- per acre.

(3). Pits—

4' x 4' x 4' (40' x 10' apart), 27 per acre @ -/2/- each 3/6/- per acre or 3 - to 4/- per acre.
3' x 3' x 3' (20' x 20' apart), 109 per acre @ -/1/- each 6/13/- per acre or Rs. 6/- to 7/- per acre

2' x 2' x 2' (15' x 15' apart), 193 per acre @ -/1/-4 each 4/- per acre.

1½' x 1½' x 1½' (10' x 10' apart), 436 per acre @ -/1/-3 each 6/13/- per acre or Rs. 6/- to 7/- per acre

II. Sowing

-/8/- to -/12/- per acre

Fencing with thorns.

-/8/- to -/12/- per acre

III. Tending and weeding.—

I Weeding

2/- to 3/- do.

II "

1/8/- to 2/- do.

III "

Rs. 1/- do.

IV. Planting including carriage of seed

Rs. 2/- do.

and tilling up gaps

Rs. 1/- do.

In Madras the bunding of streams was started in 1903-04 when 50 were built and 38 added in 1910-11. In all 89 bunds had been built at a cost of Rs. 80/- (27).

America—Estimates by a distinguished committee of the National Resources Board place the tangible money loss suffered by citizens of the United States on account of erosion at \$100,000,000 annually. In the judgement of the Committee this justifies a federal expenditure of \$20,000,000 a year for erosion control and prevention. (9). In other words an expenditure amounting to 5% of the estimated loss was considered justifiable.

7. Maximum gradient up to which cultivation is advisable.

America.—When correlating erosion with land use, slopes were classified as follows.—

I Gentle (0 to 15 per cent gradient);

II Moderate (16 to 30 per cent gradients);

III Steep (over 30 per cent gradients)

America.—The following table summarises the effect of slope on erosion for the various land use classes deduced from studies, in the Norris dam watershed lying in eastern Tennessee and western Virginia (U.S.A.):—

Land use class	Percentage of erosion for slopes		
	Gentle	Moderate	Steep.
Forest	0	51	7
Pasture	15	22½	28
Idle and abandoned	5	26	36
Crops	15	20	31

There is a correlation between slope and erosion per cent in the three classes of land use excepting forest. Crop land should ordinarily be confined to gentle slopes. (31).

The steepness of the slope for normal conditions of tillage depends upon local conditions; in some places it may exceed 5 per cent, while in others it is no more than 2 per cent. Lands steeper than that of this group are not suitable for cultivation without effective control measures. (37).

Africa.—3.75 feet in 100 feet is regarded as an average slope for cropping and other major farming operations in Africa. (36).

America.—According to the recommendations for strip cropping in Nebraska, Kansas and Oklahoma, no land with a slope of more than 12 per cent—or a 6.9° gradient should be brought under any form of cultivation: lands with a slope of more than 3 per cent—or a 1.9° gradient are too steep for terracing. (8).

Run-off and erosion behave in very different ways. With two soils used, a silty clay and a sandy loam and gradients up to 20 and 16 per cent respectively, run-off increased with the first increments of slope (up to about 4%) and then tended to approach a constant figure. Erosion, on the other hand was only moderate in amount below 4% gradient, but the steeper slopes produced a very rapid increase. A comparison of the erosion experienced on the two soils showed that for slopes from 2 to 8 per cent the sandy soil was the less erosive. At 15% slope for the clay loam and 16% for the sandy loam the position was definitely reversed. (13).

BENNETT and CHAPLAIN instance several cases. Some soils can be cropped with a fair degree of safety on slopes having a gradient up to about 20% such as some of the very porous gravelly soils in the southern Appalachians. On the other hand, one or two per cent may be sufficient to give appreciable erosion as on the Knox silt loams. (13).

India.—GORRUE in para. 5.4 of his recent book "Land management in the Punjab foothills" (Govt. Press Lahore, 1941) suggests a slope of 1 in 4 as the maximum to be permitted, for bringing land under cultivation, for average Punjab soils and of 1 in 6 for Siwalik sandstones, gneiss and shale. (21).

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ITEM 4.—MANAGEMENT AND IMPROVEMENT OF FOREST GRAZING.

By Mr. A. L. Griffith, I.F.S., Silviculturist, Forest Research Institute.

Introduction.—The subject was discussed at the 5th Silvicultural conference at Dehra Dun in 1939. The proceedings of the conference were sent to all local governments and heads of forest departments in the provinces.

The conference came to an impasse when dealing with the technique of grazing management and improvement as will be seen from paras. 1 and 2 of the resolution passed which were—

RESOLUTION ON ITEM 11.

Resolved that—

1. This conference considers that effective limitation and full control over the numbers of cattle admitted to graze are essential preliminaries to any proper management of grazing, either in forests or in pasture lands, and that until these can be enforced none of the benefits can be achieved which should be obtainable by better methods of management tested and proved by research.

2. Limitation and control over numbers of cattle admitted to graze are, however, essentially matters of policy and administration. This conference therefore refrains from suggesting ways and means by which they may be established.

Priority of problems.—Of all the problems dealing with the management of grazing, its limitation and control is the most important and as it is essentially a problem of administration and policy it is included in the agenda of this meeting.

Need for Limitation.—The need of restriction of grazing incidence to what the forest can support has been dealt with in detail in the paper of the central silviculturist read before the silvicultural conference and in the other papers and the debate on item 11. All pasture research must rest on the basis of incidence and the results of most scientific pasture methods can be nullified by alteration of incidence.

Opinion of the Conference.—The general feeling of the conference was that firstly the grazing incidence should be effectively controlled and secondly that careful investigation should be made of the grazing possibilities of each area to ensure that pasture or fodder wastage did not occur.

Propaganda is essential.—This limitation and control has to be backed by administrative action of course but it was also felt that propaganda would greatly aid the attempts to solve the problem. In general people believe that forests and pastures have unlimited amounts of pasture. The cultivator however, realizes that although he grazes his cattle on the stubble, crop residues, and such fodder as he can raise, the restricted area of his farm is still insufficient for the maintenance of his cattle. That is why he sends them to the forests and pastures. It needs to be pointed out to him that forests and pastures have their own limits for the cattle of the district just as his own farm has for his own cattle.

Possible method of practical approach.—Each type of area will need its own treatment and control and will vary very widely indeed. The chief difficulty will be that of economics. While a uniform type of control will obviously be inadvisable yet all measures will of necessity have to start from the collection of local data. It is felt that present working plans give scant attention to grazing and grazing data. It is suggested that the working plans officer is a ready means by which such data could be collected particularly if a revenue officer, members of local bodies, and influential villagers co-operate.

Dissemination of information.—It is also suggested that the local working plans officer is unlikely to be in possession of the latest information on his problem. Efforts should be made widely to disseminate up-to-date information as soon as it becomes available.

It would also help if provinces would keep the F. R. I. informed a little more regularly of what their local committees are doing for at present, information comes into the F. R. I. in a rather haphazard way.

Lands other than forest land.—It is also brought to notice that the grazing and pasture of forest lands is only a very small part of the total grazing and pasture lands of India. In discussing these problems it is suggested that this fact should be carefully considered.

Avoidance of wastage.—It has already been noted above that doubts were expressed at the silvicultural conference whether the grazing pasture and fodder possibilities of the forests were fully utilized. It is suggested that working plans officers should also consider this point and suggest how better utilization could be done.

Bihar meeting.—It is of interest in this connection that at the request of the province the central silviculturist while on tour in Bihar attended a meeting with representatives of the forest and agricultural departments of the province to discuss the subject of grazing and fodder for purposes of local administration.

The meeting made the following recommendations:—

1. In all protected forests and private forests under government administration, the basis of management should provide for a due proportion of suitable fodder species and for their proper utilization. Natural local species should provide an ample selection of these.

2. The existing fodder possibility of the reserved forests is not being fully utilised and steps should be taken to do so whenever economically feasible by systematic haymaking, baling, and extraction.

3. All private owned forest areas should be brought under management so as to meet the proposals envisaged under 1 and 2 above according to local circumstances.

4. All waste land, whether government or privately administered, that can be taken over for developing suitable fodder grasses or other fodder species, should be brought under proper management for this purpose.

5. With the knowledge that is at the disposal of government on the management and utilization of fodder species it is not considered necessary to institute any extensive experiments at present. What is first necessary is the collection of certain relevant data such as information of the areas and their locations that would be made available under 1 to 4 above.

6. The problem is so urgent that not only should immediate steps be taken to obtain the information referred to in 5 above but action should be taken as soon as the information begins to become available.

It will be seen that the object of the recommendations was to get action not only in collection of data but in the application of the indications of the data.

It should be noted that some of the above recommendations have been in practice for years in occasional provinces and are incorporated in working plan prescriptions. This state of affairs is not, however, general.

Connection with Item 3, Erosion.—It is also brought to the notice of the board that this question of control of grazing and limitation of its incidences is one of the first requirements in any form of erosion control and should therefore be considered in conjunction with item 3. In practice it is almost impossible to separate the two subjects.

Conclusion.—It is therefore suggested to the board that there is an urgent need for—

(1) administrative machinery to control and limit grazing incidence to what the land can stand;

(2) propaganda to the pasture users;

(3) collection of local data;

(4) Application of the local data thus collected without a long time lag.

ITEMS No. 3 AND 4.—RESOLUTION ON ITEM 12 OF THE SILVICULTURAL CONFERENCE, 1939, REGARDING EROSION AND FORESTRY IN INDIA AND RESOLUTION ON ITEM 11 OF THE SILVICULTURAL CONFERENCE OF 1939 REGARDING MANAGEMENT AND IMPROVEMENT OF GRAZING.

It was decided to take these two items together as they were so intimately connected.

In introducing them, Mr. Howard said that the Silviculturist was instructed at the last Silvicultural Conference to produce a leaflet on certain aspects of erosion, control and he accordingly prepared a leaflet (No. 27) which was before the Board. But the actual resolution of the Silvicultural Conference was directed at a rather special type of erosion prevention. It was based on the extremely difficult problem of the foothills of the Punjab where it had now been successfully tackled.

Proceeding, Mr. Howard said that much of the erosion and floods in India was the result of the deforestation at the headwaters of the streams. Bad forest management also amounted in practice to deforestation. This question of erosion prevention had been the subject not merely of conferences of forest officers but of engineers and agriculturists and not only in India but all over the world. Some provinces had already been doing something to tackle this problem. The Punjab, for example, had created a special circle which, it was understood, was spending 4½ lakhs of rupees on erosion prevention work. The speaker had recommended to the Advisory Board of the Imperial Council of Agricultural Research that further conferences on this could really do very little, because the total problem of erosion and floods in India had never yet

been collected together into a form that any conference could really grasp what the problem was in front of them. As the Hon'ble Member had told the Board the Advisory Board of the I. C. A. R. had recommended that a special officer—not a conference—be put on to go round India and write up what the actual erosion problem was, so that later a conference could sit down and suggest some method by which that problem could be tackled—whether, for instance, it should be tackled from the Centre or by provinces individually or whether it should be tackled by combinations of provinces or whatever it might be.

Mr. Howard then referred to the inter-provincial Ganges Commission. That Commission was composed of representatives of the United Provinces, Bihar and Bengal. After having sat for some time the Commission came to the conclusion that although it realised that something must be done, it had not enough data to say what.

Mr. Howard was of the opinion that the best thing was for the Board to back up the present position, namely, to put somebody on to study the problems as soon as possible who could write up the whole thing and say what the problem really was.

Mr. Harlow asked whether there would be one officer or more.

Mr. Howard replied that there might be one officer or two or three. The officer would have to get to know the whole range of the problem and it affected not only forestry but irrigation and agriculture. Whoever the individual was, he should be a forest officer, because it had been said repeatedly all over the world that unless the headwaters of the rivers were afforested, it was useless trying to tackle the problem lower down. To tackle the headwaters involved land management and such land was often under the forest departments. The Advisory Committee of the I. C. A. R. had therefore definitely recommended a forest officer. In conclusion Mr. Howard asked that the Advisory Committee's recommendation might be upheld as that would be the quickest way to make a start on this gigantic problem.

Mr. Hall: "We in the United Provinces think that there should be a separate department to deal with this whole question of land development which is so big a problem that it is not the job merely of the Forest Department or the Agricultural Department or the Irrigation Department. We think a separate department ought to be formed for this purpose in each province after the war."

Mr. Davis endorsed Mr. Hall's view.

Mr. Howard: "That is, of course, a further stage. But what is wanted is for a start to be made now".

Mr. Hall: "At present we have neither the requisite staff nor the funds. In addition to the separate department proposed we also think there should be a Board or Advisory Committee for each administration unit proposed in the note. Each province concerned could send a member to this committee and co-ordinate the work in the way."

Mr. Harlow: "If you take the Central Provinces, we fall into about five river basins, and it will be no good appointing a provincial committee unless we were co-ordinating with what Bombay or Orissa did. Our position is very different from that of the United Provinces."

Mr. Davis thought that, having appointed a special officer and he having definitely defined the problem, the Government of India would presumably give the Provincial Governments instructions as to what they thought should be done. He was strongly of the opinion that in the United Provinces they should form a new and separate Department to carry out the necessary work, which not only related to erosion, but covered the whole range of grazing control and land management in general. The Forest Department alone would not be able to do the work. There would have to be a separate Department, which to start with would have to include experts from various other Departments, *e.g.*, the Forest, Agriculture and Irrigation Departments.

Mr. Hall pointed out that centrally either a Department or one man or one committee could not do very much. They certainly wanted somebody in the Centre for co-ordinating the work, for advising, and so on. But the whole question of land management was now so big and so important that it was much more than one department of the Central Government could possibly do. The matter was extremely important and they in the United Provinces had not the time during the war to undertake the work. Mr. Hall had not wanted this subject on the agenda, and apart from passing a resolution upholding what was said at the Silvicultural Conference, he for himself would leave the question alone at the moment and treat it as the subject of a separate resolution.

Sir Harold Glover spoke at some length about the experience of the Punjab in dealing with the problem of erosion. After touching on the geological aspects of the question, he referred to the value of propaganda especially among the villagers in the matter of the control of grazing. He also referred to the legal powers under the Act now in force in the Punjab and to a modification of that Act (which was pending before the local legislature) to make it have general application to the whole of the province.

Sir Harold was in general agreement with the view that the whole problem was inseparable from general land management. Erosion was not a problem of forest land and village waste alone or that of cultivation alone. It was a problem which affected the whole of the State in its social and economic spheres.

The speaker then recounted to the Board how the Forest Department in the Punjab were tackling the problem of erosion in collaboration with the Irrigation, Agriculture, and Co-operative Departments. He particularly drew attention to the difficulty of dealing with tenants at will in the zamindari areas who were averse to making any improvements in their land owing to the danger of their rents being increased. He submitted a brief note of recent soil conservation activities in the Punjab which is given in *Appendix I*.

Sir Harold in concluding said that it was very desirable to employ an officer under the Central Government to set forth what the problem was in the various provinces as soon as possible. To this end, if an officer could not easily be available, he suggested the appointment of some retired officer with experience of all departments of Government as a whole.

Mr. Hall, reverting to his point that a separate Department was necessary to tackle this problem of erosion control, suggested that as an alternative use could be made of Rural Development Departments. In the U. P. they had a Development Division in charge of a Forest Officer who was part of the organization of the Rural Development Department.

In the discussion that followed the consensus of opinion was that a start should be made now so that they might be ready for proceeding immediately after the war. Such a beginning could be made within each considerable catchment area or regional unit. The question of putting the new officer to be appointed under the forest department or not was considered also at some length. Sir Harold Glover advocated that he should be under the Forest Department. He even would suggest that the Forest Department should lend some good officer at the risk of depleting the forest staff.

A tentative recommendation was then drafted but is not recorded as it was slightly modified at a later discussion before being finally adopted.

The following is the recommendation which was finally recorded:—

"The Board feels that erosion and grazing control are so intimately connected that it must consider them together. Although in some Government forest areas grazing is already controlled, in many control is still most inadequate. Grazing in areas outside Government forests is often quite unrestricted and in these areas control is even more important than that in Government forests. There is an urgent need for—

(1) some administrative machinery to control and limit the grazing incidence to what the land can stand;

(2) propaganda to pasture users;

- (3) the collection of local data on grazing incidence;
- (4) the application of that data without undue delay.

Grazing is not the only problem which affects erosion. In Assam, and in many other provinces, the erosion problem is intimately connected with that of shifting cultivation. Plans can be evolved to regulate shifting cultivation and such plans should be evolved. The regulation of shifting cultivation is a matter of general land policy which it is for Governments to define.

Turning now to erosion in particular, the Board wishes to record that the urgency and importance of the problem are so well known and admitted that there is no need to stress them here. A good deal of experience of erosion control has already been gained in the United Provinces, the Punjab and Bombay. Sir Harold Glover has contributed an abstract attached, to these proceedings, which shows what is being done in the Punjab.

The Board considers, however, that, as soon as war activities permit, an officer or officers should be appointed at the centre to define by regions exactly what the problem of erosion and floods is. Such regions would be a river basin or a set of river basins. This officer or officers should later be expanded into an All-India Soil Conservation Service. It may be necessary to set up a different agency in different provinces to deal with the solution of the problem. But whatever the particular method may be in a given province, the Board feels that the time has come when the magnitude and urgency of the problem is such that probably it needs a complete special Soil Conservation Department in each province, preferably with a forest officer at its head, to advise Governments about general land policy and to carry out recommendations for erosion control and land management. The actual control would probably of necessity be regional by a river basin or a set of river basins.

The recommendations for erosion control would presumably be made by a sort of Soil Conservation board composed of representatives of the Central Soil Conservation Service and the Soil Conservation Departments of the various provinces."

The meeting was then adjourned to Monday, the 2nd November at 10 o'clock.

The following members who could not attend the meeting on Saturday the 1st October were present on November 2, 1942:—

1. Hon'ble Mr. Upendra Nath Barman.
2. Mr. C. E. Simons.
3. Mr. J. W. Nicholson.
4. Mr. D. B. Suthers.

In the temporary absence of the Chairman (Hon'ble Sir Jogendra Singh) Mr. Howard suggested that the items 2 and 11 relating to provision of staff at the Forest Research Institute and Colleges and Forest Education be postponed for discussion till the afternoon because the Hon'ble Member was particularly anxious to be present during the discussion of those two subjects.

Mr. Howard went on to suggest that opportunity might be taken of the presence of almost all the Members of the Board this morning to reopen the subject of Erosion and Grazing (Items 3 and 4) so that the Board might have the benefit of the views of representatives of Provinces who were vitally concerned.

This item was discussed for a few minutes and certain additions made which are embodied in the resolution given on page 54 *ante*.

Mr. Howard then proposed to proceed with item No. 1.

ITEM No. 1.—INCREASING THE UTILITY OF THE FOREST RESEARCH INSTITUTE TO PROVINCES.

By S. Howard, Esq., I.F.S., *Inspector General of Forests to the Government of India and President, Forest Research Institute and Colleges, Dehra Dun.*

This is a matter which has come up for discussion frequently in various boards and conferences and one in which finality can never be attained. At the last Board of Forestry, for example, in 1934 subjects 1 and 2 both dealt with this question. The Institute felt that the research programme were not criticised and amended sufficiently by provinces. After a full discussion on both subjects, resolutions were passed which laid down that:—

- (1) A register should be kept in provinces of items needing research.
- (2) Provincial Silviculturists and Utilisation officers should come to Dehra Dun as a matter of course
- (3) Local staff should assist the Entomologist.
- (4) The Institute should take up the problem of forest soils.
- (5) Local officers should be encouraged to come to the Forest Research Institute and work in the branches for a longer or shorter period
- (6) Research officers and especially Branch Officers should have every facility for touring in the provinces.

One of these resolutions was again reiterated at the Silvicultural Conference in 1939 which in resolution 1(7) recommended that Provincial Silviculturists should visit the Institute more frequently.

The result of all these resolutions have not been as satisfactory as might have been expected even up to 1939. After that date war work naturally absorbed more and more of forest officers' time.

2 In expressing opinions on this item of the agenda Branch officers here largely repeated the former resolutions about contact with provinces. They all emphasise the need for officers to come here and the definite suggestions put forward which the Board might like to discuss are:—

- (1) that provincial Utilisation Officers and Silviculturists should visit the Institute at a definitely prescribed interval. Once every two years has been suggested as suitable,
- (2) that Chief Conservators and Conservators should visit the Institute more frequently;
- (3) that the demonstration courses should be revived and that officers should attend them at definite intervals. The interval suggested is 7 years so that every officer in the service would attend such a course three times in 20 years;
- (4) that officers attending such a course should write a confidential report on the work of the Institute direct through the local head of their Forest department to the President.

3. Although I generally agree with the principles of the above opinions, the details are not necessarily my opinions. They have been put forward by Branch Officers or others and have merely been embodied by me here for discussion. I shall elaborate my own opinions at the Board but this is circulated for members of the Board to see beforehand. There are obviously many other methods of increasing the utility of the Institute which might be discussed, for example, publications and whether they are written suitably for the average forest officer, whether the Institute is organised in the most efficient way, whether problems are tackled in a sufficiently practical method to get definite results of use to provinces etc. It should not be forgotten that the charter of this Institute as laid down in Appendix IV of the 7th Edition of the Forest Department Code says:—

"The main object of the work to be carried out at the Research Institute is to obtain results which will be of practical utility to Government and to the public, and it is of the greatest importance that this should be constantly borne in mind by all Research Officers. The investigations and experiments carried out will incidentally lead to additions to scientific knowledge but, desirable as these may be, it is the practical results which are of the greatest importance."

"In all publications, therefore, the fullest practical details must be given. This is more especially necessary in connection with the commercial utilisation of forest produce, in order that those interested may be able to judge whether it is likely to be profitable for them to invest capital in the industry dealt with in any particular publication."

This quotation brings out also another point and that is that the utility of this Institute is not confined to the Forest Department of Provinces and States but is also very largely concerned with the utilisation of timber and other forest products after it ceases to be the care of a Forest Department. The whole of the Utilisation Branch and the Chemistry and Minor Forest Products branch, by their very nature, are mainly directed towards problems which concern the trade and the consumer. The Entomology Branch and the Mycology section of the Botany Branch are also directly connected with the trade and the consumer in so far as their work deals with the converted timber after it ceased to be a living tree. I may add here that the utility of the Institute to the trade and the consumer is dealt with by the Central Advisory Board on Forest Utilisation. Any opinion, however, which this Board may care to express on that side of the work also will naturally be most welcome

ITEM No. 1:—INCREASING THE UTILITY OF THE FOREST RESEARCH INSTITUTE TO PROVINCES.

Mr. Howard, in introducing the subject said:—

"I want you all here to realise that you can at any time call upon the services of the President or any other officer of this Institute to come down to your province and discuss any problem with you without any obligation whatsoever on your part. The Institute here is entirely at the disposal of the Provinces. That apparently is not always realised at present. I am not absolutely certain whether it applies to Burma or not, but I think it may apply to Burma because Burma contributes something like Rs. 35,000 a year to this Institute and, therefore, Burma should have a right to call upon the officers here."

"Coming to the specific proposal of increasing the utility of the Forest Institute I may say that the paper which I have prepared summarises the opinions of the officers of this Institute and some forest people outside the Institute. Their recommendations all come to the same thing and that is that there must be far more personal contact between the officers of this Institute and officers in the provinces. I would like to remind you, however, that there is another side to the question which has not been stressed by any of these officers and that is the utility of the Institute to the general public. People sometimes forget that the Utilisation Branch and the Chemistry and Minor Forest Products Branch are actually more concerned with the general public than they are directly concerned with the forest service. The products with which these branches deal have really almost ceased to be of direct interest to foresters because they have become articles of trade and have fallen within the circles of interest of the merchant, of the trader and of the consumer."

"This particular item of the agenda so far as it concerns the forest department, must naturally be more concerned with post-war development than with war time developments because the two branches which I have mentioned, namely, the Utilisation Branch and the Chemistry and Minor Forest Products Branch, are already directly and continuously concerned with work for the Ordnance Department, the Inspectorate of Stores, the Air Force, the Ordnance Laboratory at Cawnpore, the Director General I. M. S. and they have little time for their normal activities."

"You will see that at various times suggestions have been put forward to keep the Institute in touch with Provinces. These suggestions cover such things as the keeping of registers in all provinces of research items which are necessary; that Silviculturists, Utilisation Officers and others should be encouraged to come to Dehra Dun as a matter of course; that higher officers, like Chief Conservators

and Conservators should come here more frequently; that the demonstration courses should be revived and that they should become a definite part of every officer's service."

"All these suggestions are methods of bringing other people into contact with the Institute and not so much of taking the Institute out to the Provinces, and it is on the latter point that I should like to hear some expression of opinion from you."

"It has so happened that for six years of my service I was a Research Officer here and I, therefore, know something about the point of view of Research Officers. But I have also spent some 20 more years as an ordinary forest officer and I know that Dehra Dun's work is not always favourably regarded by the ordinary forest officer in the provinces. I, therefore, ask you here to state openly your true opinion of the work that is being done here. What I want you to give is your frank criticism, if it can be constructive criticism so much the better but, if not, then if you will tell us what is wrong, we will do our best to put it right."

Mr. Hall—"You state in your paper that you will give your own opinions later and will elaborate your own opinions on what you propose. Can we have those first?"

Mr. Howard—"My own opinion is that officers of the Institute should take their ideas themselves to the provinces and that there should be a great deal more touring by them actually out in the jungle. What I felt as a forest officer was that people from Dehra Dun, who came as Research Officers, did not always get far from headquarters and often did not get really into the jungles to discuss problems with the local forest officers. In fact sometimes they did not get beyond the railway station. That is one of the things I would certainly like to see emphasised here and I think really it sums up the principal change that I would like to make. I should like far more touring from the Institute into the provinces."

Mr. Hall—"Why is that not being done now? Is there any difficulty on the question of funds?"

Mr. Howard—"None whatever."

Mr. Harlow—"Is it not a fact that we asked you to send individual officers down to provinces?"

Mr. Howard—"I think so. If you call more people we will be only too ready to send them. For example Mr. Subharwal wrote to us and asked for a man to go down and advise them on bridge construction. But it was the first time for years that we had had such a request. We sent a man straight down. On another occasion I also sent a wood preservation officer to Bihar."

Mr. Harlow—"I asked for Mr. Kamesam to come down on the question of Bridge Construction. He promised to send me blue prints of various standard types of bridges that had been produced here at Dehra Dun and I think it is three years ago now but nothing has turned up yet."

Mr. Howard—"Did you ever send a reminder?"

Mr. Harlow—"I can not remember."

Mr. Howard—"If anything goes wrong like that then please do write again. It shows something wrong however that an officer can visit a province on a definite problem and then not even send the blue prints."

Mr. Hall adverted to the point about touring by Institute Officers and suggested that whenever any Research Officer toured in a province he should inform the local forest officers so that they might not miss the opportunity of taking his advice even in cases when the Research Officer's visit was not in connection with the Provincial Forest department.

Mr. Howard—"What I really want to get from you are examples of where the Institute has failed. Mr. Harlow has given a very good example."

Mr. Simmons suggested that officers passing through Calcutta might also get into touch with Assam, Bihar and Orissa.

Mr. Hall—"What do you mean by saying that a register should be kept in provinces of items needing research?"

Mr. Howard.—"It was a resolution passed by the Board of Forestry in 1934."

Mr. Hall.—"Did it refer to items of the Forest Research Institute only?"

Mr. Howard.—"People here had complained that when they sent round a programme of research it was not constructively criticised by provinces. It came back exactly as they had sent it out. What I emphasise here is that a forest officer is much too busy to sit down and make up a programme of research that he wants for his province. It is the job of the research officer to get to know the provincial needs so that he can draw up a correct programme and the provinces will merely have to criticise that."

In the discussion that followed there was warm appreciation of the contacts established by the Central Silviculturist with the provincial silviculturists. The Board would welcome such contacts among other branches, for example the Utilisation Branch.

It was also felt that the Central Utilisation Officer had so much to do that he could not very well afford to undertake extensive touring so much so that there was a definite need for an Assistant Utilisation Officer.

Mr. Harlow conceded the valuable link provided by the various pamphlets issued by the Institute which went a long way in increasing liaison between the Forest Research Institute officers and provinces.

Mr. Hall suggested that the President might personally discuss with a visiting officer the work of the Institute. He did not consider it desirable that a provincial officer visiting the Institute should write a confidential report to his Government about the work of the Institute.

Mr. Harlow suggested that there might be more social contact between the provincial representatives and officers-in-charge of specialised branches of the Institute since such contacts might prove very useful.

Mr. Marchant enquired whether there was a social club for the officers of the Institute.

Mr. Howard replied that there was no such club for officers although one had been suggested. There was at present a Tennis Club which fulfilled the functions of a Social Club.

Sir Harold Glover asked for close co-ordination between the work of the silviculturist in the Punjab and the silviculturist at the Centre—especially in view of the fact that there was a programme of soil conservation which had of late come to the fore. He, therefore, wanted when staff became available to augment the posts under the Central Silviculturist so that Provinces could get the necessary assistance from the Centre in matters of soil conservation.

Mr. Sothers was of opinion that the results of silvicultural research carried out at Dehra Dun would not always be applicable to provinces where conditions were entirely different from those at Dehra Dun.

Sir Harold Glover spoke in appreciative terms of the work of the Central Utilisation Branch of the Institute. He also emphasised the scientific side of the department.

Mr. Sothers raised the question of propaganda in forestry. He said that it was rather a difficult thing to put out propaganda in provinces. He, therefore, wished that there should be some organisation for propaganda at the Centre.

Mr. Howard explained that propaganda from the Centre was already being done. For example, he himself had written about half a dozen articles in the various newspapers about the work of the Forest Research Institute. There was also an arrangement by which whenever they published anything, publicity in newspapers was also given to it. He, however, agreed that they had not gone far enough in the matter of propaganda. Propaganda in the daily press was more difficult than in periodicals. In the matter of broadcasting also no progress had been made.

Mr. Howard incidentally mentioned the visit of War Correspondents to the Forest Research Institute recently.

He undertook to see that the officers of the various technical branches should broadcast if possible regarding the work of their respective branches.

Mr. Hall complained that the propaganda so far put out from the Institute in articles and in the publication "Indian Information" gave an impression to the public that the whole of the Forest Department work was the sort of work that was being done by the Institute. Those articles did not mention the activities of the various provincial forest departments.

In connection with the spreading of the knowledge of the work of the Institute through the publication of pamphlets on various research items the Hon'ble Mr. Upendra Nath Barman expressed the desire that copies of these leaflets should be specially sent to provincial ministers.

"The Board summarised its ideas for increasing the utility of the Forest Research Institute to provinces as follows:—

1 Provincial Silviculturists and Utilisation Officers should come to Dehra Dun as a matter of course

2 Local staff should assist the Institute as much as possible.

3 Local Officers should be encouraged to come to the Forest Research Institute and work in the branches for a longer or shorter period.

4. Research Officers, and especially Branch Officers, should have every facility for touring in the provinces.

5. Demonstration courses should be revived.

6 The Honourable Members suggestion of a Senior Forest Officers' Conference will help relations between the Institute and provinces.

7 Whenever a research officer visits a province or passes through it, even on work not directly connected with the forest business of that province, he should inform the local forest officials so that they can meet him. This is especially applicable to places like Bombay, Nagpur and Calcutta. Forest Officers from Bengal, Assam, Bihar and Orissa will all be interested to know when research officers are in Calcutta

8 The Institute should continue to print and issue the short leaflets now being sent out which are helping to bring the Institute work into touch with provinces. One copy of all such publications should be specially earmarked for the provincial ministers.

9 As speed of publication is very important, the President, Forest Research Institute should have ample powers for local printing. It is suggested that he should be permitted to sanction up to Rs. 500 on each item provided he has the amount in the budget.

10. The Board does not agree with the suggestion that visitors to the Institute should send a confidential report on its work to the President but suggests that the President should see such visitors before their departure and get from them their opinions.

11 The more direct contact there is between any visitors and the actual worker, for example, the officer-in-charge of a section, the better. It is suggested that contact is greatly helped by social intercourse outside office hours.

12. It is the function of the Institute to inform the general public of the work of the Forest Department which local forest officers often have no time to do. Officers at the Institute should be encouraged to write up their work in popular language, to make broadcasts etc. Such articles or broadcasts should not be confined to research work, they should also deal with the work of the forest department in general."

The Hon'ble Mr. Upendra Nath Barman, who could not attend the previous sitting of the Board on the 31st October, wished to take the opportunity to say a few words on the question of the potential production capacity in different provinces which closely touch on the co-ordination of regeneration policy. Different provinces are now working separately and there is no practical co-ordination between one province and another. Unless there is co-ordination between the provinces nothing can be done by the Forest Research Institute which is a Central body. The speaker said that the potential production capacity of different provinces of India as a whole, as regards the regeneration of

different species of wood must be known. If this is once known then, according to the speaker, the next question would be how the production would be utilised in the economic interest of the country.

The speaker continued:—"So if we adopt a co-ordinated policy of regeneration from now on there will come a time when we shall be able to base our forest policy throughout India on somewhat definite plan and that will be of very great advantage to us. I should also like to mention that we should also ask the States to take common interest in forestry in order that their efforts and efforts of British India Administration might be co-ordinated. Such co-ordination between States and British India will be helpful not only to the States but also to us. That is the thing which I wanted to bring to your consideration and that is a matter which will vitally affect us sometimes after if not today. No doubt today we are only very much concerned with meeting war demands, but shortly time will come when we shall have to take a broader view to make India self-sufficient as much as possible."

Mr. Howard.—"First of all may I answer the last part of the question put by the Hon'ble Mr. Barman, namely, the question of the co-ordination of the State Forest Departments with British Indian Administration. Our policy has always been to permit any State to take advantage of the Central Institute and the services of the Inspector General of Forests whenever it liked. Although that has been the policy in theory it has only recently happened in practice. I think I am right in saying that during the ten years, previous to my coming here, only two States had ever been visited by the I. G. of Forests. After I came here the Government of India agreed that it was to their interest to encourage proper forest management in Indian States and they, therefore, undertook that any visit by the I. G. to a State would be on exactly the same terms as his visit to the provinces. Since the Government of India agreed to this it had sent a circular to all the States telling them that the services of the I. G. were at their disposal. Since this was broadcast, less than two years ago, the States have actually been brought into the picture."

"The Hon'ble Mr. Barman's main question is whether we can have a co-ordinated regeneration policy between provinces. This question was debated by this Board on Saturday and we were all agreed that at present at any rate it was neither practicable nor necessary to have such a co-ordinated regeneration policy. The provinces, being entirely autonomous, naturally like to have their own regeneration policies but anyway it would be difficult for a province like Bengal to co-ordinate with a province like the U. P., when there are completely separate governments which have entire control over their forest departments except in so far as their policy might interfere with the general well-being of neighbouring provinces or States. Of course generally the question is extremely important and that was the view taken by the Board."

Mr. Hall explained that the U. P. had so much to do in the way of the regeneration of those species that anything they might do could not possibly affect any other province at present.

Mr. Howard, then read out for the Hon'ble Mr. Barman's information the general conclusions arrived at by the Board on Saturday, namely, that after the war the time might come when an exact plan of co-ordinated regeneration might be evolved.

He thought that that would be a wiser policy at the present as it did not commit any member of the Board to anything but it did at the same time bring out what the Hon'ble Mr. Barman had in mind.

Sir Harold Grover said that Mr. Barman's scheme envisaged regional plans going beyond provincial boundaries.

It was considered by some members that what was wanted was correct co-ordination between the Centre and each province concerned and not between provinces as such.

The Hon'ble Mr. Barman expressed himself to be in general agreement with the view taken by the Board on Saturday, but he said that he would like to have the question of collection of proper statistics also taken up.

Mr. Howard explained that the collection of statistics was already covered by the resolution on Item No. 3 regarding surveys of timber and other forest products. *Mr. Howard* also briefly explained, for *Mr. Barman's* information, the sense of the Board's discussion on Item No. 5. (The Board's recommendations are page 10, ante)."

ITEM No 9 (b) NEW ITEM—THE SENIOR FOREST OFFICERS' CONFERENCE.

Mr. Hall asked when this Board of Forestry, which was previously constituted entirely by selected forest officers for dealing with technical matters, came to be a Board including non-official members and ministers.

Mr. Howard said that there was nothing new in the constitution of the present Board since the Joint Parliamentary Committee had noted as far back as 1934 in paragraph 305 of their Report on the Forest Services that:—

"We think that in future co-ordination will best be secured by the creation of a Board of Forestry on which, in addition to forestry experts, representatives of the Provincial governments would serve, and we think that the Provinces should be empowered to combine for the purpose of setting up such a Board and contributing to its expenses "

Mr. Hall suggested that if they were going to implement the policy laid down by the Joint Parliamentary Committee to include ministers and non-officials the agenda of the meeting should consist only of general items and not technical matters. He would not welcome the combination of both.

Mr. Howard cleared up the apparent misunderstanding that the Board of Forestry would replace the Senior Forest Officers' Conference. He said a senior officers' conference would undoubtedly continue to meet since forest officers ought to meet as frequently as possible, but the advantage, *Mr. Howard* pointed out, in having this Board composed of technical as well as non-technical members, would be that forest officers would benefit by the presence of ministers. He drew a distinction between this Board of Forestry and the meeting of the Senior Forest Officers—the latter being exactly the same as the Central Board of Irrigation which was purely a technical body.

The Hon'ble *Mr. Barman* understood that the meeting of the Board of Forestry should take place on two different sets of days—one being devoted for the discussion on technical subjects by purely technical officers and the other being devoted to subjects of general interest only, members present including technical as well as non-technical officers. He was apprehensive that there might be some questions which might overlap between purely the technical meeting and the non-technical meeting. So in such cases ministers of different provinces, if they wanted to attend any discussion on technical subjects, should be allowed to do so and that would meet his requirements. It might provide the ministers with some knowledge of the technical side also.

Mr. Harlow followed up the point put forward by *Mr. Barman*, namely, that the Board of Forestry might meet in two parts—first part consisting of technical subjects and the other part devoted to general matters, both the meetings taking place consecutively.

Mr. Hall's complaint was that the Government of India had implemented the recommendations of the Joint Parliamentary Committee without consulting the provincial governments on the departure in their former policy.

Mr. Howard pointed out that it was exactly the recommendation of the Joint Parliamentary Committee which the Government of India had implemented.

Mr. Simmons was also in favour of two sets of meetings taking place consecutively.

The Hon'ble *Mr. Barman* further suggested that the subjects might be divided into two classes, technical and non-technical. Technical matters might be discussed by the Forest Officers when they meet a day or two earlier, but at the subsequent meeting of the Board the decision arrived at the meeting of the Forest Officers should be placed before a general meeting because the ministers were likely to be interested to know what took place between the Forest Officers.

It was explained that the Hon'ble Sir Jogendra Singh's proposal meant the Senior Forest Officers' Conference to be an entirely separate body from the Board of Forestry.

The Board then recorded the following remarks:—

The Hon'ble Sir Jogendra Singh suggested that in addition to the Board of Forestry, which would normally meet triennially, there should be a conference of senior Forest Officers to meet more frequently, if possible annually, to discuss technical subjects on the analogy of the Central Board of Irrigation. The Board endorsed this suggestion.

ITEM No. 13.—THE DISPOSAL OF SURPLUS ARMY TIMBER STOCKS AND THE REGULATION OF FELLINGS AFTER THE WAR.

By Sir Harold Glover, Chief Conservator of Forests, Punjab.

Introduction—The following remarks apply mainly to the coniferous forests of the North Western Himalayas, but probably are of wider application.

1. *Post-War (1914-18) conditions*.—The consumption of timber by the Army in the war of 1914 to 1918 was nothing like so great as in the present war and it was only in the last eighteen months of last war that heavy fellings were made. At the end of the war there was a heavy demand by the Railways for sleepers, a spirit of optimism prevailed and heavy fellings of inferior species such as fir were made in the Punjab and in Kashmir. The heavy railway demand for wooden sleepers continued for some years. There was a glut of timber in the general market and prices fell until there was little or no profit left. Steel sleepers gradually replaced wooden sleepers, until the low prices at which wooden sleepers could be obtained enabled them to compete with steel sleepers. Fellings were curtailed and the Punjab Forest Department worked at a deficit.

2. *Present War conditions*.—Conditions are different in this war and the demand of the Army for timber up to the end of 1943 is greater than can possibly be met. Advance fellings, particularly of inferior species have been made, and supplies of timber are limited only by the labour available. Industry has been starved of timber and phenomenally high prices are paid in the black market.

3. *Post-War prospects*.—The coniferous forests lie in the recesses of the Himalayas and timber takes about 18 months from the time the trees are felled to reach the plains depots.

Thus at the end of the War there will be—

(a) a large stock of timber in the Army Storage Depots, partly in Karachi and partly up country, which will be available for release to Industry;

(b) a year or two year's yield of timber cut in the forest or en route to the plains;

(c) large numbers of trees marked and sold but not converted the timber from which will probably find its way to the plains within three years of the end of the war.

Policy.—What should be the policy of the Central Government and of the various Provincial Governments and the large States?

(a) *Army Stocks*.—Industry will probably be able to absorb these stocks if they are released slowly. The Railways both in India and Overseas will be very short of wooden sleepers, and if inferior species can be creosoted, 50 per cent. of the B. G. and most M. G. coniferous sleepers will be taken by the Railways. The balance rejected sleepers will go to the timber trade. The release of these stocks will presumably be controlled by the Timber Directorate and should be gradual.

(b) *Timber en-route to the markets in the plains*.—Presumably this timber will be marketed by the traders who own it. The disposal of low grade timber, particularly fir will be difficult. Many traders are likely to need money urgently and will sell at slump prices unless the Central Government has formulated a policy in advance. The bankruptcy of any large trader would cause a slump in prices and Government may have to finance the trade. No Province or State can be expected to act independently.

(c) *Trees marked and sold but not converted.*—Large numbers of trees will probably still be unfelled. The greater portion (say 66 per cent.) of these trees should be retained by the Forest Proprietors (Government or State) and the royalties refunded to the traders. Some conversion must continue otherwise the hill labourer will have no work.

(d) *Subsequent fellings*—It may be assumed that if the above policy is adopted supply and demand will be adjusted within 3 years of the end of the war. New factories are being established to meet war demands and all will need packing cases, quite apart from other more direct uses of timber and timber products. Subsequent fellings will depend entirely on the market demand, and on the normal annual yield. Provinces and Forest owners will have to face an immediate reduction in revenue after the war, which should be accepted willingly in the certainty of forest revenues rising later on.

(e) *Yield assessment.*—It is probable that once the accumulated stocks of timber have been got rid of there will be a demand for timber in excess of the annual increment of the forests, particularly of the more valuable species.

Care must be taken to assess the annual yield conservatively, and as the demand may be expected to increase gradually in each succeeding decade the yield should be under rather than over assessed. It is suggested that increment should not be included in the calculated yield which should be based on the actual volume of standing timber. Remeasurement at intervals of about 15 years would enable the yields to be raised at each revision.

It is obvious that every Province will have either to revise its Working Plans, or recalculate the yield of its forests as soon as is practicable after the war has ended.

General—The above remarks and suggestions concern the timber trade and the forests of Northern India. Similar conditions probably obtain throughout India, as every Province has made and is making great efforts to ensure that the Army shall obtain all the timber it needs for war.

The suggestions put forward above are tentative only, but may serve as the basis for laying down a post-war policy which will save the timber trade from the disaster which would follow the uncontrolled release of large Army stocks of timber. A planned economy for the timber trade and for the development of India's forest estate is required and this policy must be sufficiently flexible to take account of the new and as yet largely unforeseen conditions which will prevail at the end of the War.

Sir Harold Glover in introducing the subject of the disposal of surplus army timber and regulation of fellings after the war drew attention to the experience of the Punjab and Burma at the end of the last war when a lot of money was wasted owing to optimism and to the lack of a definite and pre-determined policy. He did not want to add to his remarks in his paper and left the Board to debate the question.

Mr. Simmons visualised that after the war instead of there being a drop in the price of timber there might be an initial rise.

Mr. Hall emphasized that, in view of the possibility of the timber market being flooded by large stocks of army timber after the war, thus seriously affecting the Forest Department prices of timber, Provincial Forest Departments must not only control the policy of disposal but also control prices. He particularly had in mind large consumers like the Railways.

Sir Harold Glover said that Government was in a favourable position as compared with other Provinces in as much as most of the forests in the Punjab were owned by government and they could control production by proper regulation of fellings.

Mr. Harlow was also in favour of controlling prices of timber.

Sir Harold Glover suggested that they might follow the precedent set up by the Northern Sleeper Pool for controlling sleeper prices. Messrs. Hall and Harlow were of opinion that the Railways should not be permitted to

purchase sleepers direct from contractors but only through the forest departments. In this way they could prevent the Railways forcing the price down and the railways would be safeguarded from a rise in prices.

Mr. Hall was prepared to go even further and control the price of main timber prices to the public and other consumers for a period after the war. The public might require protection from speculators.

In the discussion that followed the consensus of opinion was that there should be established some sort of Disposal Board for the Defence Department stocks of timber after the war.

Sub-para. (b) of Sir Harold Glover's paper relating to timber en route to the Markets in the plains was dropped after some discussion, since the problem was more for the Punjab than for other provinces.

Item No. (c) of his paper, relating to trees marked and sold but not converted, then came up for discussion.

In the end item No. (c) was also dropped.

Items (d) and (e) relating to the policy regarding post war fellings in relation to the accumulated stocks of timber released by the army raised a lively discussion on the question of control of prices with special reference to the prices of railway sleepers.

Mr. Hall put forward the point of view of the United Provinces Forest Department that there must be some control of sleeper prices.

Sir Harold Glover emphasized that the question of policy as regards future fellings was not entirely a provincial one but that it had to be considered as an all India one and a resolution might be passed by the Board.

Mr. Hall.—“We should draw up some sort of resolution on this question of price control and we want to keep the resolution as general as possible. I would merely suggest that this Board further resolves that the Forest Departments should continue to control prices of timber for a period after the war at least in regard to railway sleepers.”

Mr. Sahharwal.—“If I understand you right, it appears that after the war you want to control the prices in consultation with the Sleeper Controller or some such similar authority. If so we will also do likewise in consultation with the Eastern Group?”

Mr. Hall.—“The prices have already been to some extent fixed in consultation with the Timber Directorate.”

Mr. Sahharwal.—“Yes, but that is for the duration of the war. I am thinking of controlling the prices after the war particularly of railway sleepers.”

Mr. Hall.—“After the war the Forest Department should continue to control prices in relation to railway sleepers in consultation with the railway authorities.”

Mr. Simmons agreed with the views expressed by Mr. Hall.

Sir Harold Glover.—“I take it that the control of prices of timber other than sleepers would be automatic?”

Mr. Hall.—“It is not an automatic process. The stocks that you have may not be required by the railway authorities at all. With regard to price control, the only thing we want to be definite about is this question of control of prices of railway sleepers which is far and away the most important individual market. For and *chir* the price of a sleeper to a considerable extent determines the price of scantlings.”

Mr. Howard.—“Are you afraid of a slump or a rise in price?”

Mr. Hall.—“My own personal opinion is this, that for a period of about a year after the war the stock of army timber in hand will prevent any rise in the price of timber; after that I think that prices are very likely to rise.”

Mr. Simmons wanted to stabilise prices—neither to allow it to rise nor to drop.

Mr. Hall.—“I think the opinion of the Board might be on some such lines as follows:—

“This Board further resolves that the Forest Department should continue to control prices of timber for a period after the war at least in regard to railway sleepers.”

The objection to that seems to be that some Provinces do not control the prices now. What we really want to do is to try to control prices in consultation with the railway authorities and steps should be taken to stabilise all prices of timber particularly sleepers. Actually, I would like to go beyond all this. What I have in mind is that the Ministers of popular governments after the war will consider that the general public and the villagers, who have not been able to buy timber to repair their houses and other property, should be in a position to purchase timber at fair prices. It is therefore important for forest departments to control prices after the war of all common timber species and sizes and not merely the price of railway sleepers although they are most important."

Mr Simmons reiterated that action should be taken to stabilise sleeper prices in consultation with the railway authorities to avoid fluctuations.

Mr. Harlow—"We cannot control general prices in peace time. The only thing we are interested in is in organising ourselves against the Eastern Group. That is really what we are up against."

Mr Hall was emphatic that he for himself would prefer the resolution to be restricted to control of prices of sleepers only.

Sir Harold Glover intervened to say that it would be very difficult to control individual prices. Thousands of tons of packing case material would be released after the war the prices of which could not be controlled.

Messrs. Hall and Harlow were both of the opinion that the resolution from the Board of Forestry on this particular subject should be confined to sleepers and should not deal with anything else.

Sub-para. (d) and (e) relating to subsequent fellings and yield assessments in the paper prepared by *Sir Harold Glover* raised a discussion on the question of future forest management by Provincial Forest Departments.

In regard to the future policy of fellings *Mr. Sabharwal* pointed out that provincial governments must realise that they would not be able to get from their forests after the war the same revenue as they are deriving during the war.

Sir Harold Glover hinted at the probability of very great pressure being brought to bear on Provincial Forest Departments to produce as much money from their forests as possible.

Mr. Howard followed up the point raised by *Mr. Sabharwal* by relating his own experience not only in regard to India but through-out the world that whenever a country wanted to raise more revenue one of the first things it tried to tap was its forest wealth. He summed up the position as envisaged by *Mr. Sabharwal* as saying that as a result of excess fellings which have had to be undertaken during the years of the war it must be recognised that fellings must be much lighter for some years after the war.

Sir Harold Glover remarked that anybody who did not want a resolution to be passed was a suspect. *Mr. Simmons* would like to put the question to the vote of the Board.

Finally the Board of Forestry noted as follows:—

(a) The release of Defence Department stocks after the war must be controlled by a disposal board or some such agency and the Board of Forestry emphasises that the Forest Department must be adequately represented in any planning for such disposal.

(b) The Board of Forestry further advises that, in consultation with railways, steps should be taken to stabilise sleeper prices after the war.

(c) Owing to the advance fellings which have been necessary during the war only much lighter fellings will be permissible for some years after the war till the lost capital has been replaced. This obviously implies the early revision of all working plans particularly with a view to the reassessment of the yield on a conservative basis. A planned economy for the timber trade and for the development of India's forest estate is required and this policy must be sufficiently flexible to take account of the new and yet largely unforeseen conditions which will prevail at the end of the war.

ITEM No. 11.—FOREST EDUCATION AT THE INDIAN FOREST COLLEGE FOR SUPERIOR
GAZETTED SERVICES.

(Paper for the Board of Forestry Meetings, New Forest October/November 1942).
By E. C. Mobbs, Esq., I.F.S., Principal, Indian Forest College, New Forest
(Dchra Dun).

1. The Indian Forest College, which was opened in May, 1938, is now in its 5th year. Two courses have been completed (1938-40 and 1940-42), and the College is now half way through the first year of the third course. The College started with 16 students in the 1st course; there were 20 in the 2nd course; and there are now 28 in the 3rd course. It can therefore be considered as firmly established, and it is already building up for itself a good reputation.

2. General accounts of the College and of the progress made are contained in the Annual Reports for 1938-39, 1939-40 and 1940-41 (all published), and for 1941-42 (as yet unpublished), and in the Principal's reports for the first course (published as Appendix III of the Annual Report for 1939-40 and in the Indian Forester for July 1940) and for the second course (published in the Indian Forester for July 1942). A brief general account of the College will also be published in the Proceedings of this meeting of the Board of Forestry.

3. The Rules for the College, which were approved by the All-India Forestry Conference held in Delhi in December, 1937, were simply a copy of the old rules of the Indian Forest Service College (1926 to 1932) with certain minor modifications. Experience has shown that these were not entirely satisfactory, and with the approval of the President certain deviations have been made from them. In order to regularise and standardise matters, revised rules are therefore being prepared and will be submitted for the consideration of the Board of Forestry. The chief items to be discussed are:—

I.—Qualifications for admission to the College.

II.—The Course of Studies.

III.—Official Recognition of the College Diploma.

IV.—Provision of Special Short Courses—e.g., for Rangers being promoted to gazetted service, for Class II officers being promoted to Class I service, and "refresher courses" for gazetted officers.

I.—Qualifications for Admission to the Indian Forest College.

(a) Educational Qualifications.

4. It is proposed to widen the scope of the qualifications to admit candidates with an honours B.Sc. degree in any science or in mathematics or in agriculture, providing that it is not lower than 2nd class, or an M.Sc. degree in any science, mathematics or agriculture, of any class, providing that the B.Sc. degree was not lower than 2nd class.

5. Under the existing College rules [rule 7 (i) (a)], the qualifications are restricted to an Honours B.Sc. in Chemistry, Botany or Zoology, or an M.Sc. degree not lower than a second class in any science, provided that one of the above three sciences was taken in the B.Sc. degree, and that B.Sc. degree is now lower than second class.

6. It does not seem necessary to limit the science degree to these 3 subjects. A man taking Chemistry usually combines it with Physics, and often has done no Botany or Zoology. He is therefore no better suited for our purposes than a man with a Physics degree. In fact, owing to his greater knowledge of mathematics, the man with the physics degree is in some respects perhaps preferable. Other sciences such as Geology or Physiology, would appear to be just as useful a preliminary to Forestry as Chemistry. A mathematics degree is also a useful qualification, especially in view of the increasing importance of statistics in forest research. It is noteworthy that one of the only two students who obtained an honours diploma in the first course was a mathematics man.

7. Certain Universities do not grant an Honours B.Sc. degree. In some cases it is possible for students to offer major and minor subjects, and in 1st or 2nd

class in such cases would be acceptable in lieu of an honours degree. It is not proposed, however, to make a general rule for such cases, as it would be difficult to frame a rule to suit the varying cases without laying the college open to admit ordinary degrees from any university. The addition of the words "or its equivalent" after "Honours B.Sc. degree", and the proviso to the rule under which Provinces and States can put forward candidates without the full education requirements will provide for such cases, while safeguarding the high standard required for the college. The President would then be the final deciding authority.

(b) *Combination of Botany and Mathematics.*

8. It is proposed to add a note in the Rules of the College, in connection with the educational qualifications, to the effect that a knowledge of Botany and Mathematics up to the standard of the Intermediate examination is desirable.

9. Much time has to be spent on the teaching of elementary Botany and Mathematics, and it was at first proposed to make a knowledge of these subjects up to the Intermediate standard compulsory. It has been found, however, that in some universities it is not possible for students to offer both of these subjects together, and in any case very few students actually do so in those universities where it might be possible. Such a rule would therefore considerably restrict the selection of candidates and would probably mean that the majority of candidates put forward by Provinces and States would have to be exempted from it. It is therefore considered best to point out the desirability of this additional qualification, while not making it compulsory.

(c) *Age Limits.*

10. It is proposed to raise the age limit from 22 to 23. The present rule is from 19 to 22 (the candidate must not have attained the age of 23 on the 1st April of the year in which he seeks admission). This rule can be relaxed by the President "in special cases", and has in fact been relaxed in a considerable number of cases. Indian students often take their honours degrees when they are 22, and as some time must necessarily elapse between the date of their taking the degree and their admission to the College, this raising of the age limit appears desirable.

(d) *Preliminary Practical Training.*

11. No preliminary practical training is made compulsory, nor is this proposed, but a note is proposed to the effect that a minimum period of 3 months' preliminary practical training is desirable.

12. In the cases of students with a B.Sc. degree only, since the results of the degree examination usually come out in June, selection of candidates must necessarily be after that date. Provinces would probably not have sufficient time to select their candidates if the course of the College were to commence in September or October, and there are various other good reasons for keeping to the existing arrangement of commencing in April. With this arrangement, there is ample time for Provinces to give their candidates at least three months' practical training before they come to the College, and in some Provinces (e.g., Assam and Bihar) this is already compulsory.

13. On the other hand, to make preliminary practical training a compulsory qualification for admission to the College might make it impossible for many students to obtain their M.Sc. degree. Candidates with an honours B.Sc. may apply for selection while still studying for their M.Sc. degree. The M.Sc. examination is held usually in March, and the students can then proceed direct to the College. If practical training were compulsory, such students would not be able to complete the course for the M.Sc. It is therefore suggested that it is better to leave the question of making practical training compulsory or not to the Provinces and States deputed the students to the College.

II.—The Course of Studies.

14. In the existing rules, the approximate hours for each subject are laid down. It has in practice not been possible, nor desirable, to follow these hours. The total number of hours given for the first year is 740. Actually the number

available has worked out to about 590 only. It is therefore proposed to follow the procedure of the Ranger College and only indicate the subjects to be studied and not to lay down the hours.

15. The present programme and allotment of subjects has been drawn up after consultation with the various Branch and other officers of the Forest Research Institute who lecture, and the main scheme was fixed at a general meeting of the Principal and the Branch Officers under the President, Forest Research Institute and College. The principal deviations then sanctioned were:—

(i) Physics (which included Heat, Light, Sound, Magnetism, Electricity and the Properties of Matter) was completely eliminated from the course.

(ii) A short course in Timber Mechanics and another in Timber Physics were included in the programme.

(iii) All Inorganic Chemistry was eliminated. Chemistry was confined to the Organic Chemistry of Plant Products, with special reference to Minor Forest Products, and Soil Chemistry.

(iv) The course in Geology was reduced to the bare practical minimum for practical Forestry. Icebergs, earthquakes, volcanoes, etc., were omitted, and special emphasis placed on the rocks and general surface stratigraphy of India, and on the practical identification of more common rocks.

(v) Wood Technology was dealt with as a separate subject, in addition to the time allotted to Botany and Utilisation.

(vi) A little more time was allotted for Silviculture and Forest Management than was contemplated under the rules.

16. The experience of the first course made certain other changes desirable, and the scheme of studies followed for the second course and now being followed, with slight modifications only, for the third course seems very suitable. The principal further changes are:—

(a) Organic Chemistry has now been completely eliminated from the course, except in so far as it is needed for demonstrations or practical work in the Minor Forest Products lectures, under Utilization. (It was found that the Organic Chemistry course for the first class occupied much time but was not of great practical importance).

(b) As against (a), more time has been allotted to Soil Chemistry, both for lectures and practical work. This, combined with the lectures on Soils under Silviculture, and with the work on rocks under Geology, has proved eminently useful. The object aimed at is to make students able to carry out field analyses of the soils they are likely to meet, and to be able to interpret a technical analysis of a soil when received from the Soil Chemist.

(c) No separate course is given in Timber Mechanics, but this is included in Engineering.

(d) No separate course is given in Timber Physics, but this is included in Wood Preservation under Utilization.

(e) Special provision is made for lectures in Ecology under Botany.

17. It is suggested that the Board of Forestry approve the present system under which the course of studies is left to the Principal, who works in close contact with the Branch Officers and Lecturers in this matter, and under the general control and direction of the President. The subjects to be studied, will, however, be printed in the rules, but without detailed allotment of hours.

III.—Official Recognition of the College Diploma.

18. It is proposed that the Diploma of the Indian Forest College should be officially recognised by the grant of the use of the letters A. I. F. C. (Associate of the Indian Forest College) by holders of the Diploma. The sanction to use these letters would have to be granted by the Government of India, and it is suggested that the Board of Forestry ask the Government of India to give the necessary sanction.

19. There is a very considerable desire on the part of students to obtain official recognition of their diploma in this way. It is a post graduate diploma requiring two years' study. Two years' post graduate study in other sciences would give them an M.Sc. or Ph.D. degree in most universities. Further, if they were to go to Europe or America to study Forestry, they could obtain a science or Forestry degree there, with the right to use letters after their names. It seems reasonable, therefore, that two years' post graduate study here should receive similar recognition.

20 There appear two alternatives:—

(i) to grant letters such as D. F. (Diploma in Forestry) or D. J. F. (Diploma in Indian Forestry), comparable with D. P. H. (Diploma in Public Health) and D. T. M. (Diploma in Tropical Medicine), and

(ii) to grant letters of associateship of the College, such as A. I. F. C. (Associate of the Indian Forest College) comparable with associateship of many technical institutions. This has the advantage that it is possible also to grant a Fellowship later on, as a reward for research or other work of outstanding merit

It is proposed that the second alternative be adopted.

21 Precedent exists for the grant of such letters by the Government of India.

(a) The Indian School of Mines grants the use of the letters A. I. S. M. by students who have obtained the Diploma of the School. The use of these letters was approved by the Governor-General in Council in 1926, when the Indian School of Mines was formally opened.

(b) The Imperial Institute of Sugar Technology grants the use of the letters A. I. I. S. T. and F. I. I. S. T. by students passing out of the Associateship and Fellowship courses respectively. This is provided in the prospectus of the Institute, as approved by Government. (It is not clear whether a definite Government order was ever issued regarding this).

(c) The Imperial Agricultural Research Institute grants the use of the letters Assoc. I. A. R. I. This was sanctioned by the Government of India in a Press Communiqué, dated the 2nd October 1930, issued by the Department of Education, Health and Lands.

(d) The Harcourt Butler Technological Institute grants the use of the letters A. H. B. T. I. and F. H. B. T. I. for the diploma and fellowship courses respectively. In this Institute, only graduates in Science or Agriculture are admitted, and the duration of the course is two years, i.e., comparable to the Indian Forest College. The use of the letters was sanctioned by the Government of India in 1932.

These examples are sufficient precedent, and it is suggested that on the basis of these, and since the Indian Forest College only admits graduates in Science, Agriculture or Mathematics, and its course is thus a 2 years' post graduate course, the Board of Forestry will recommend that the Government of India sanction the use of the letters A. I. F. C. to holders of the Diploma of the College.

22. It is also for consideration whether the Board of Forestry should also at the same time recommend sanction for the letters F. I. F. C. It is suggested that this should be done. Suitable qualifications for the grant of the Fellowship of the College might be:—

(i) Candidates for the Fellowship of the Indian Forest College must be Associates of the College (i.e., holding the College Diploma), of not less than 3 years' standing.

(ii) They must have done not less than three years' continuous research at the Forest Research Institute, or at such other research institution as may be approved by the Board of Forestry, or not less than five years' research in a research post of a Provincial or State Forest Department, or they must have carried out such extensive research, while holding other posts, as in the opinion of the Board of Forestry shall not be less than the equivalent of the foregoing.

(iii). They must have published a thesis embodying their original research, which shall be accepted by the Board of Forestry as qualifying for the Fellowship of the College.

All three qualifications must be satisfied for the grant of the fellowship.

IV.—*Provision of Special Short Courses*—e.g., for Rangers being promoted to gazetted service, for Class II officers being promoted to Class I service, and "refresher courses" for gazetted officers.

23. Before anything is decided about the institution of such courses, it is necessary for Provinces and States to indicate their requirements. Much will depend on how many men would be deputed, and how frequently such courses would be required.

24. The present staff of the college is so small and already so fully occupied that it could not alone undertake to conduct courses of any length or frequency. Two alternatives appear possible:—

(a) If the number of men likely to be deputed to such courses is few, then it is suggested that they be deputed for 1 year's training, to coincide with the 2nd year of a regular course at the Indian Forest College (e.g., in the same way that Mr. G. S. Dhillon attended the Indian Forest College for the 2nd year of the 1940-42 course, and obtained the Diploma of the College, after having obtained the Honours Certificate of the Ranger College). Such men would attend most of the classes with the regular students of the college, but might omit parts of the course (e.g., the Zoology) so as to be able to devote more time to Management and Working Plans and to extra Silviculture and Mensuration.

(b) If the number of men likely to be deputed is many, and courses are likely to be fairly frequent, then a special course might be instituted for such men, to last say 6 months, or 9 months. But this could only be done with the addition of an extra man on the staff of the College. In this way, it would be possible to institute one course each year, and not only in alternate years, as under (a).

Rules for the Superior Forest Service Course at the Indian Forest College, Dehra Dun.

(Subject to such alterations as may from time to time be ordered).

SECTION I.—CONSTITUTION.

1. The College is under the administrative control of the Inspector General of Forests, who is assisted by the Board of Forestry.

2. The Superior Staff of the College consists of:—

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| (1) The President, | (3) The Research Staff, and their Assistants. |
| (2) Professor of Forestry. | (4) The Lecturers to the Indian Forest College. |

3. The President is charged with (1) general administration, subject to the control of the Government of India; (2) the supervision of the buildings, quarters and gardens; (3) the control of the accounts and the conduct of correspondence.

THE COURSE.

4. The course of study at the Indian Forest College is a post graduate course designed to fit selected students for appointment to the Superior Forest Service, and to afford a higher class education in Forestry to students deputed from Indian States and elsewhere.

The standard of the course will be that of the degree course at a British University leading up to the grant of the College Diploma in Forestry.

SECTION II.—ADMISSION RULES.

5. The maximum number of students to be admitted to this course will be decided by the Inspector General of Forests from time to time subject to the approval of the Government of India.

6. Categories of students.

The course will be open to students of the following categories:—

(1) Students from Indian States and private students desirous of obtaining the Forestry Diploma who have reached the qualifying standard prescribed in rule 7 (i).

(2) Provincial Forest Service officers deputed by local Governments to undergo the course of training.

(3) Students deputed by Governments of Provinces preparatory to their appointment to services in those provinces constituted to take the place of the Indian Forest Service.

(4) Officers in class (2) who are not deputed but are permitted to undergo the course at their own request while on leave.

(5) Students deputed by Governments of countries outside India.

In the case of students deputed by an Indian State all applications for studentships must be endorsed by some responsible official such as an Agent to the Governor General, a Resident, a Political Agent, a Superintendent or a Deputy Commissioner, to ensure that the studentships asked for are based on the actual requirements of the State only.

7. No student will be admitted to the College unless he is in possession of:—

(i) (a) A certificate that he holds a degree of B.Sc. (Hons.) in Chemistry, Botany or Zoology, or an M.Sc. degree not lower than a second class in any science provided that he has taken one of the above three sciences in his B.Sc. degree and that B.Sc. degree is not lower than a second class.

(b) Qualifications from a foreign university accepted by the Government of India as equivalent to the above:

Provided that if a Province or state wishes to put forward a candidate who does not fulfil all the requirements of Rule 7 (i) (a), it may do so.

(ii) A certificate that he has attained the age of 19 years and has not attained the age of 23 years on the 1st April of the year in which he seeks admission. The Inspector General of Forests is empowered to relax this rule in special cases.

(iii) A certificate of first class physique and health including good vision and hearing, signed by a Civil Surgeon.

(iv) Two certificates of good moral character.

8. The President is empowered to refuse an application for a studentship without assigning any reason subject to the general control of the Government of India in the Education, Health and Lands Department.

SECTION III.—STUDIES.

9. The course of studies will extend over 2 years.

10. *Subjects and Examinations.*—For examination purposes the subjects will be divided into two groups:—

I. Auxiliary Sciences.

II. Forestry, with Surveying and Engineering; and there should consequently be two main examinations.

(i) the Preliminary Examination, and

(ii) the Final Examination.

The Examinations will be partly written and partly oral, and there will also be practical examinations in all the preliminary subjects and in Forest Botany and Forest Zoology among the Final subjects.

11. *Preliminary Examination.*—The Preliminary Examination will comprise the following subjects:—

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| (1) Physics. | (5) Zoology Part I. |
| (2) Chemistry. | (6) Elementary Silviculture, Part I. |
| (3) Botany, Part I. | (7) Survey and Drawing. |
| (4) Geology and Physiography. | (8) Forest Engineering, Part I. |

12. Candidates will not be permitted to take the preliminary examination until they have been through the first year's course. Each candidate must take all the subjects and must pass in at least six of them. If he fails in more than two he will be required to leave the College. Candidates who fail in only one or two subjects will be required to appear six months later for the subjects in which they have failed. Candidates failing to pass will be required to leave the College.

Final Examination.—The Final Examination will be held once a year at the conclusion of the course. No candidate will be admitted to the Final Examination unless (1) he has already passed the Preliminary Examination; (2) he produces a certificate, countersigned by the Professor of Forestry, that he has satisfactorily completed an approved course of practical work in Forestry, Surveying, and Forest Engineering and that he has passed a practical test in the use of Surveying instruments. Candidates will be required to offer all the subjects.

13. The subjects for the Final Examination will be as follows:—

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| (1) Forest Botany, Part II— | |
| (a) Pathology (Mycology). | (c) Botany of Indian Trees. |
| (b) Oecology and Plant Geography. | (d) Structure and Properties of Wood. |
| (2) Forest Zoology, Part II. | |
| (3) Silviculture, Part II | |
| (a) General including soils. | (c) Working plans. |
| (b) Silviculture of Indian trees. | (d) Protection. |
| (4) Forest Utilisation. | |
| (5) Forest Management— | |
| (a) Mensuration. | (c) Systems. |
| (b) Valuation. | |
| (6) Forest Policy and Law. | |
| (7) Procedure and Accounts | |
| (8) Forest Engineering, Part II. | |

14. In both the Preliminary and Final Examinations any candidate who fails to obtain 50 per cent. of the total number of marks in any subject will be considered to have failed in that subject.

15. *Periodical Examination.*—In order to test progress and prepare periodical reports, informal examinations and tests in both theory and practice will be held from time to time: in such examinations marks obtained for theoretical work will not count towards the final merit list, but a record will be kept of all marks given for practical work, which will be taken into consideration in preparing the final order of merit list.

16. *Final Order of Merit.*—After the final Examination a list will be prepared showing the final order of merit based on marks (1) obtained in the Preliminary Examination, (2) obtained in the final Examination, (3) awarded from time to time for practical work, including field work, knowledge of instruments, drawings, working plans, etc., and (4) awarded for games and general conduct during the 2 years' stay at the College.

17. *Apportionment of subjects to First and Second years.*—The subjects are allotted to the first and second years respectively, with the approximate time to be devoted to each as follows:—

Approximate number of hours.

Year.	Subject.	Lectures.	Laboratory or Indoor practical.	Field work.
First	Physics	32	64	Time indefinite, partly on tours.
	Chemistry	40	80	
	Botany	80	144	
	Geology and Physiography	40	20	Time indefinite, partly on tours.
	Zoology, and	24	20	
	Silviculture (Elementary)	66	..	
	Survey and drawing	30	60	
	Engineering, Part I	50	..	
	Total first year ,	352	288	

Year.	Subject.	Lectures.	Laboratory or Indoor practical.	Field work.
	<i>Forest Botany.</i>			
Second—	Pathology	16	32	
	Wood Structure	16	32	
	Botany of Indian trees	16	32	
	<i>Silviculture.</i>			
	General and Systems	16	..	
	Protection (gen.)	16	..	
	Silviculture of Indian trees.	16	16	About 12 hours.
	Forest Utilization	40	..	
	<i>Forest Management.</i>			
	Mensuration	24	..	About 24 hours.
	Valuation	10	..	
	Working Plans	32	..	Working Plans field work 4 to 5 weeks
	Forest Policy and Law	24	..	
	Forest Engineering	80 (Drawing etc.)	100	About 3 weeks.
	Forest Zoology	10	20	
	Total Second Year	322	232	

SECTION IV.—GENERAL RULES.

18. *Ability to meet expenses.*—Prior to the admission of a private student the parents or guardians concerned must satisfy the President that they are willing and able to defray the whole expenses of the student.

Fees.—The annual fee for the two years of the first biennial course will be Rs. 8,500. This sum is payable in advance in four instalments, due on April 1st and October 1st of each of the two years. This will cover cost of tuition, lodging, light and water and other services at headquarters for the two years. All living expenses will be met by the students themselves. A common mess will be provided and no cooking will be allowed in residential quarters.

19. *The Durbars of Indian States* deputed students to Dehra Dun shall prior to the admission of their nominees into the College, deposit annually in advance with the Professor of Forestry the sum of Rs. 1,200 for each student to meet expenses (exclusive of travelling) for one year. This sum is in addition to the College fees prescribed above. The deposit of a similar sum will also be required from private students.

20. *Cautions money.*—All students except those already in Government service shall, on their arrival at Dehra Dun, deposit in the Post Office, pledged to the President, the sum of Rs. 100 as caution money and security for good behaviour and conduct, and for due observance of the rules.

21. *Employment of private students.*—The President will maintain a register of the names of private students who succeed in obtaining certificates and who desire to obtain Forest appointments, and will circulate annually a list of such passed students to Durbars of Indian States (through the Political Officers concerned) and to Conservators and other persons likely to be in need of the service of trained Forest Officials: he will, if possible, note in the list the minimum pay each student is prepared to accept and in what parts of India he is prepared to serve. In forwarding applications for service the President will make such recommendations as he thinks fit.

No private student has any claim to an appointment in Government service.

22. *Marriage of students.*—No student of European or Anglo-Indian extraction, not already in the permanent employment of Government or of an Indian State, shall be admitted to the Superior Forest Service course if he is married: nor shall any such student, whether in the permanent employment of Government or of an Indian State or not, marry before he has finally quitted the institute. A breach of this rule will render the student liable to dismissal.

23. *Cost of equipment.*—Books and camp outfit must all be paid for in cash. All necessary articles must be obtained from the Institute contractors or as the President may direct. Students are expected to bring sufficient money with them to Dehra Dun in addition to the caution money prescribed in rule 20.

24. All expenses of travelling will be met by the students themselves. If actual expenses are not allowed by Local Governments to their students a sum of Rs. 1,000, must be deposited in advance with the President to cover the costs of the prescribed tours for two years.

25. *Quarters.*—The President will allot quarters to the students on their arrival in Dehra Dun. No student may be absent from his quarters after 10 P.M. without written permission. No visitors will be allowed to sleep in the Hostel without the permission of the President.

26. All students must abide by such orders as the President, or other such officer authorised by him, may issue from time to time for the purpose of enforcing and ensuring cleanliness and sanitation.

27. No dogs are allowed in quarters, nor may dogs, horses or firearms be brought inside the Institute grounds or taken on tour.

28. Breakages of furniture, etc., in the Institute buildings must be paid for by the students, who are also responsible for the acts of their servants.

29. *Dress.*—All students will be expected to conform to such regulations regarding dress as the authorities may find it desirable to issue.

30. *Camp equipment.*—As camp equipment each student requires:—

(1) A small tent, not larger than 10 feet by 8 feet.

(2) A camp bed.

(3) A small camp table.

(4) A camp chair.

31. *Books and instruments.*—The books and instruments required by each student will be fixed by the Professor of Forestry from time to time.

32. *Leave.*—During the course of instruction no student may leave Dehra Dun without the written order of the Professor of Forestry. Nor may students while in camp leave the camp headquarters without the written order of the officer in charge.

33. *Holidays.*—Saturday will usually be observed as a holiday or devoted to excursions. In camp it will ordinarily be a half holiday. Such of the usual gazetted holidays as are allowed will be notified as such from time to time.

34. *Removal for incapacity.*—It is left to the discretion of the President to remove any student who is considered incapable of following the course with advantage at any time during the first six months of the course.

35. *Indebtedness.*—Students are not permitted to incur debts. Complaints under this head will be investigated by the President and, if proved to be well-founded, will render the offender liable to punishment.

36. *Punishment.*—The following punishments may be inflicted by the President and at his discretion may be endorsed on the offender's final certificate:—
Censure, deduction of conduct marks, removal or dismissal.

If any student other than a private student is dismissed, the President will telegraph to the authority who deputed him to the Institute asking for order for communication to the student concerned. In the case of a private student intimation of dismissal will be sent to the parent or guardian concerned.

37. *Annual reports.*—Annual reports on the work and conduct of each student, shewing marks obtained, will be issued by the President at the conclusion of each academic year and sent to the authority deputing the student to the College or to the parent or guardian in the case of a private student.

38. *Library and Museums.*—The Institute library, museums and herbaria are available for the use of students under such rules as the President may make from time to time.

39. *Drill.*—All students who are not members of the Indian Defence Force will undergo a course of drill or physical training.

40. *Games.*—Games are compulsory for all students.

ITEM No. 11.—FOREST EDUCATION—RANGER TRAINING AT THE INDIAN FOREST
RANGER COLLEGE.

By C. R. Ranganathan, Esq., I.F.S., Director, Indian Forest Ranger College,
Dehra Dun.

An account of the early history of the Indian Forest Ranger College is given at pp. 340 *et seq.* of Volume III of "The Forests of India" by Professor Stabbing. The recent history of the College is given in an appendix to this note. It may be mentioned here that this College started in 1878 and is thus the oldest forest training centre in the British Empire, that it has trained over 1,500 rangers, and that it has set the standard of and served as a model for forest training centres throughout the country.

Besides this College, there are at present two other centres for training rangers in the country, one at Poona and one at Bangalore. The latter is a purely local arrangement for training Mysore rangers and we have no information about the syllabus followed. The centre at Poona, is attached to the Agricultural College. Its primary purpose is to train rangers for Bombay province, but private students and nominees of Indian States are also admitted. The Poona syllabus is closely modelled on ours, but there are some points of difference.

The University of Travancore instituted in 1940 a Diploma course in Forestry of the standard of the ranger course here. It is understood that this course is not to be a permanent feature of the University and that on completion of the first course in 1942, no further courses will be held for some time.

The present position therefore is that this College trains rangers for all provinces except only Bombay, and for all important States except Mysore and Travancore. In other words, it has to train men for service in all the ecological and climatic conditions prevalent in the country. The question has been raised whether it is desirable and practicable to train in one centre men destined for service in such diverse conditions as obtain, for instance, in Madras, Sind, Assam and Kashmir. In short, is forest training best given centrally or regionally? Attention is invited to correspondence which appeared in the "Indian Forester" for September, 1941, and January, 1942, in which this question has been discussed at some length. Whatever may be the ideal solution of this problem, the fact is that, in our circumstances, we have no real choice in the matter. We have no accurate indication of the number of rangers recruited annually in normal years, but at a rough estimate this number appears to be nearer forty than fifty for the country. That being so, so long as the principle holds that each training centre must pay its way out of its fee income, it seems unlikely that any increase in the present number of training centres could justifiably take place in the near future. Dehra Dun must therefore continue to train rangers for all India.

In former years when Dehra Dun trained rangers for the northern provinces only, the instruction, especially field instruction, was more or less confined to the silviculture of sal, deodar, and chir, the tours being mainly in the adjoining forest of the United Provinces (known for a long time as the School Circle). Subsequently the range of touring, expanded, visits being paid to U. P. forests outside the School Circle and to certain selected areas in the Punjab. The position was radically altered when the Madras Forest College closed down in 1938, and the southern provinces, which had sent their students to that College began to send them to Dehra Dun. This College then ceased to be a regional training centre and became an all-India one. Instruction based on sal, deodar and chir was no longer adequate for students for whom the main species was teak. In order to meet this situation, the tour programme of the students was revised under the orders of the Inspector General of Forests so as to include visits to representative South Indian forests. Such long distance touring had become possible at low cost owing to the availability of fare and luggage concessions granted by the railways to students of the forest colleges at Dehra Dun. Students who passed out the College in 1939 and 1941 have had

the advantage of seeing forests in both northern and southern provinces under a wide range of ecological conditions.

It has been suggested that such generalised training based on extensive as opposed to intensive field work is perhaps not the best way to train rangers; that the standard of instruction, especially theoretical instruction, is perhaps needlessly high and might result in unfitting rangers for the actual work they will be called upon to do; that what provinces require are "practical" men capable of doing a job of work themselves and carrying out orders given by the divisional forest officer; that the disadvantages of making the ranger course approximate too closely to the gazetted officer course must be constantly kept in mind.

The reasons for the generalised training and extensive touring have been explained. I believe that that is the only practical way of meeting widely varying provincial requirements. I doubt whether a ranger intensively trained in sal and deodar forests but with no knowledge of teak or sandal would be really acceptable to, say, Madras. On the other hand, I think all provinces would gladly accept a ranger who had besides a fair knowledge of the silviculture of the provincial species, an acquaintance with the principal species of India, added to a thorough grounding in the theory of silviculture. The ecological basis of silviculture is clearly brought home to the students through such wide-spread touring.

The charge that the course at Dehra Dun lays stress on theory at the expense of practice is often made. Critics say that all they expect of a ranger is that he should be able to do a job of thinning or sowing or planting or felling according to instructions given to him; that he should be able to estimate for and execute engineering works including surveying and road making; that for the rest he would not be expected to do any planning or take any original action. In my opinion this is a limited view to take of a ranger's duties. As forestry becomes more intensive in India, more and more must inevitably be left to the discretion of the local ranger, as it would be impossible for the divisional forest officer in such conditions to give detailed directions regarding operations. If I were a divisional forest officer, I should much prefer to have rangers who could be relied on to carry out the intentions of the working plan without constant guidance from the divisional forest officer. A ranger who does thinnings by dint of practice or "instinct" but without a clear understanding of the principle of thinning is liable to go hopelessly wrong. He may do well enough under one set of conditions but when he is transferred and has to face altered conditions, he is lost. The ability to correlate cause and effect, and a course of action with local conditions, can only be acquired through a sound theoretical background. Such ability is essential in a ranger, as it is impossible for a J. F. O. to foresee and legislate for every contingency, even if he had the time to do so. At the same time we certainly do not want to convert our rangers into "white collar" men, issuing orders from an office. They must be made to realise that they are practical men required to do things and get things done, but this does not militate against their knowing why and how things must be done. A practical ranger is not a rule of thumb ranger. I believe that an efficient practical ranger is usually one who knows his theory well.

A further point has to be borne in mind in this connection. A number of rangers trained in this College go out to take up posts in Indian States, where, often, they are technically the highest qualified men in forestry. Many rangers will in course of time be promoted to divisional charges in provinces, without any additional training. In most provinces the present provincial forest services occupying an intermediate position between the Indian Forest Service and rangers will soon disappear and the technically qualified men will be organised in only two categories, namely, a cadre of gazetted officers and a cadre of rangers. These several circumstances impose on us an obligation to organize our ranger course not on the basis of the minimum standard compatible with efficiency, but rather on the basis of a standard well above the minimum. Such

a high standard is easily possible under present conditions as intelligent young men with high academic qualifications are readily forthcoming to accept service as rangers in all provinces and most Indian States.

A point of some importance is the need to preserve a clear cut distinction between the ranger course and the gazetted officer course. At present both courses are of two years, and if account is taken of the preliminary practical training for rangers (in Madras the period is as long as one year, elsewhere it is at least three months), we find the anomalous situation that actually the ranger course is longer than the superior officer course. The most effective way of drawing a line of division between the courses would be to make the gazetted officer course one of three years, but this is perhaps not a practical solution in present circumstances. Nor is it possible to adopt the opposite solution of reducing the length of the ranger course. A considerable amount of common ground in the two courses is therefore unavoidable, especially as the text books are in several cases common ones. So long as the two courses are of equal length, it is difficult to ensure any very striking difference in the standard of instruction in pure forestry subjects, although some distinction might be and is made as regards accessory subjects and certain forestry subjects such as Management and valuation. The two courses are kept separate by being conducted in separate institutions, thereby avoiding some of the embarrassment felt in former years when both classes constituted wings of one and the same college. There is also the marked difference in the initial qualification for admission to the two colleges. But when all is said and done, the fact remains that there is no very substantial difference between the actual courses. To attempt to bring about a pronounced difference by lowering the ranger standard would, I fear, be a very undesirable solution of the problem. This method was adopted when the old provincial service course was instituted, but it did not prove satisfactory.

The initial academic qualification which a student must possess before admission to this College has been raised with effect from the 1942-44 course from Matriculation or its equivalent to Intermediate in Science or its equivalent. In recent years the students admitted have in most cases had qualifications well in excess of Matriculation, about two-thirds of the number admitted being indeed university graduates. The object of the formal change in the minimum qualification was to exclude, except under special exemption by the President, the usually small number of matriculates who used to gain admission to the College, as such students were a drag on the class and could not take full advantage of the course and were consequently a bad investment for the province or state deputing them. There are, however, certain states which may find some difficulty in getting Intermediates. Again some provinces may find it expedient to lower the initial qualification for the benefit of depressed or backward communities. The President's power of exemption, which may be exercised in individual cases or for a class or community, is intended to deal with such situations. Such special cases do not, in my opinion, furnish an argument for a general lowering of the initial qualification to Matriculation, because I believe that, apart from other obvious reasons, it is an advantage for it to be generally recognised that the course at this College corresponds to a degree course at a university, as in fact it does.

The last point in the paragraph above leads to the question of the desirability of the formal recognition by Government, Universities and learned bodies that the course at the College is the equivalent of a degree course at a University. This College grants certificates (Honours, Higher Standard and Lower Standard) on successful completion of the course. These would correspond to a first class, second class and third class degree. The formal token of a degree is that a graduate is authorised to write B.A., B.Sc., M.A., M.Sc., or other similar abbreviations after his name. For the graduates of this College, however, there is no official warrant for doing so. Official lists sometimes write D. D. R. against the names of rangers, but these letters are not used by the rangers themselves.

Apparently they do not take any pride in using these letters as they do not imply clearly the acquisition of a diploma or degree. It would appear desirable that the course at this College should be declared as the equivalent of a degree course and that successful students should be authorised to write approved letters after their names in token of their possession of a technical qualification. This could be done by an official charter or by legislation—Such a declaration would have the effect of enhancing the value of our course. There are several precedents for the grant of titles and letters by bodies other than universities.

The Syllabus of the course was reprinted in 1935, but it does not appear that any revision was carried out then. In several respects the current syllabus is out of date in that it does not represent correctly the course as now followed. For instance, Forest Mensuration is regarded in the syllabus as a sub-division of the subject Mathematics which is classed as a minor subject. In practice mensuration is treated as a branch of Forest Management and is classed as a main subject. The Syllabus provides for the teaching of Mathematics as an examination subject. It is to be considered whether this arrangement should continue in view of the recent raising of the initial qualification for admission and whether a few lectures in elementary trigonometry and logarithms given in the course of teaching surveying and drawing would not serve our purpose. In my opinion instruction at the College should be confined to forestry subjects and subjects allied or accessory to it which are not normally taught by general educational institutions up to the Intermediate standard. We ought not to spend valuable lecture time in teaching subjects which we might legitimately expect an average Intermediate in Science to have learnt already as part of his general education. Thus, for example, I would not include the teaching of English or Elementary Science in the Syllabus (as used to be done once) because students admitted to the College would be presumed to know enough of these subjects to follow the course; but I would include Elementary Geology in the Syllabus (at present it is not included although it has been taught since 1935), because Geology does not form a necessary part of the Intermediate in Science curriculum. That part of the syllabus which deals with Mycology and Entomology also needs revision. It is hoped to undertake this work shortly.

A point worthy of consideration by the Board of Forestry is whether any regular arrangement should be made for allowing ranger students who have passed out with outstanding merit to take the gazetted officer course with a view to appointment as Assistant Conservators. In effect any such arrangement would imply that the graduates of this College would be included in the field of recruitment of gazetted officers along with university graduates on equal, possibly even on favourable, terms. If this principle is conceded, very stringent conditions could be imposed. It could for instance be laid down that the candidates entitled to be considered for such special promotion should (1) be Science graduates of a recognised University; (2) have taken out a good Honours certificate from this College and (3) should be recommended for such promotion by the Inspector General. It would be for consideration whether candidates thus selected should be required to undergo the full two-year course of the Indian Forest College, or take only the second year of the Indian Forest College, or take only the second year of the course or take a special course somewhat on the lines of the third year provided for selected rangers before the institution of the provincial service classes. It might interest the Board to know that a ranger student who passed out top of his year with honours in 1941 was selected by the Punjab to undergo the second year course of the Indian Forest College and passed out of that College in 1942 very creditably.

An important innovation in the social organization of this College is the institution of a common mess. The mess was started in 1911 and has been working very satisfactorily. It is of a semi-official character and is run by an elected committee of students of which the Director is *ex-officio* President. It is now a condition of admission to the College that students shall take their meals at the common mess.

Enclosure.

This note takes up the story of the Indian Forest Ranger College from the point where Mr. Stebbing ended his account see page 840, Vol. III, the Forests of India.

The proposal that the Government of India should divest itself of responsibility for training rangers for the northern provinces and that the training centre should be transferred from Dehra Dun to Bareilly under the control of the U. P. Government was wisely dropped as subsequent events have proved. The main argument for this change, which was the incompatibility of training I. F. S. officers and rangers at the same centre, ceased to have weight with the closing down of the I. F. S. class in 1932 consequent on the stoppage of recruitment to that service. With the coming into being of the autonomous provinces created by the reforms of 1935, the training of rangers by the Central Government rather than by one or two provincial governments has obvious advantages, it being clearly impossible for each province to conduct a course for its own rangers. The Forest Research Institute which is the offspring of the old Forest School started in 1878 for training rangers offers so many facilities of instruction and demonstration through its staff, museums, laboratories, workshops, herbarium and forest demonstration areas that the removal of the Ranger College from Dehra Dun would have meant the sacrifice of these tangible advantages as well of the very valuable but intangible atmosphere of learning and research that invests the Institute.

Owing to the general stoppage of recruitment due to the world trade depression, the Imperial Forest College was closed in 1933 after 55 years of uninterrupted activity. The Inspector General, Mr. A. D. Blascheck, expressed the hope that it might be possible to re-open it in April 1934. Thanks to the labours of Mr. (later Sir Gerald) Trevor, who succeeded as Inspector General, the College was re-opened on 1st April, 1935, with the generous assistance of the Governments of the United Provinces and the Punjab, which provided the teaching staff free of cost to the College. In return for this concession these governments were excepted from payment of fees for their students. The College re-opened with a single class of 27 students. As it was uncertain at this stage whether a sufficient number of students would be forthcoming year after year, and as the Government of India made it a condition that the College must support itself out of its fee income, it was decided that admissions should be made in alternate years. The ranger course being one of two years, this meant that a batch of students was fully trained and sent out before the next one was admitted. It was thus possible to conduct the course with the minimum whole time staff which consisted of an I. F. S. instructor (who was also Director of the College) and a P. F. S. assistant instructor. The research staff of the Forest Research Institute aided this small staff by giving lectures and demonstrations in special subjects.

In 1937 and 1939 strength of the class rose to 35. The size of these classes became inconveniently large for work in the forest and many applications for admission had to be rejected in order to prevent further inflation in numbers. The Madras Forest College which trained rangers for the southern provinces and states of India was closed in 1938. The demand for admission to the ranger course at Dehra Dun consequently increased to such an extent that it became necessary for the Government of India to consider the restoration of the normal arrangement of annual admissions and overlapping classes. The advantages of this arrangement were always recognised and the reasons which precluded it no longer existed.

After consulting the provinces and the states interested in forestry, the Government of India decided in 1940 to restore the system of annual admissions. The admissions made in April, 1941, were on this basis. The necessary increase of staff, which will consist of a Director, an I. F. S. instructor and two assistant instructors drawn from the provincial services have also been

sanctioned. In addition; the services of a Lecturer in Engineering, and I. F. S. officer, are shared with the Indian Forest College which trains officers for the superior forest services in the provinces and states. Lectures in special subjects such as Entomology, Mycology, Soil Science and Wood Technology are, as hitherto, being given by the specialists at the Institute.

The embarrassment felt in earlier years in training rangers and gazetted officers in two wings of the same college was avoided by the constitution in 1938 of a separate college for gazetted forest officers. This college, named the Indian Forest College, is situated in the main building of the Forest Research Institute at New Forest. The name of the Imperial Forest College, which started as the Imperial Forest School in 1878 and was the fount of all the forest research and educational activities associated with Dehra Dun, was changed to the Indian Forest Ranger College. It is still housed in the same building in which it started. A large playing field for the use of its students has been formed by clearing and levelling an old orchard attached to the College.

On the administrative side too, certain changes have been made. The Board of Control and later the Board of Forestry whose meetings and resolutions formed a feature of the college progress reports have been abolished. The college is now regarded as equivalent to a branch of the Forest Research Institute and is in the administrative charge of the Director under the control of the President of the Institute who is also the Inspector-General of Forests. The present incumbent of the post of Director is Mr. C. R. Ranganathan, B.A. (Oxon.), I.F.S.

The minimum qualification for admission to the college is a pass in the intermediate examination of any Indian University with one or more of the following subjects, mathematics, physics, chemistry, botany and zoology, or a pass in any other equivalent examination. Students are in addition required to pass in a qualifying examination in English essay, mathematics, general knowledge and dictation, held by the College in a number of centres. Competitive examinations held by provincial service commissions are accepted as equivalent to the qualifying examination.

Only nominees of provincial governments and states with a guarantee of employment after passing the examinations of the college are admitted to the college. Private students have not been admitted since 1920. The rules however provide for the admission of private students provided they hold a guarantee of employment after passing out of the college.

7. The fees of the college are Rs. 1,500 per annum. The fees are paid by the provincial governments and states deputing the students. It is also usual for the provinces and states to pay a stipend of Rs. 50 per mensem to the students, as well as their actual travelling expenses.

The instruction given consists partly of lectures at the college and partly of practical training in a number of selected forests in several provinces, chiefly the United Provinces and the Punjab. Physical training and team games hold, as always, an important place in the course. The students are required to wear a prescribed uniform while on duty.

A sign of progress is the institution of a common mess for the students. The college is a residential institution and the absence of such a mess was felt to be a drawback which it has now become possible to remove.

Since the college started in 1878 it has trained over 1,500 men who have served all over India and some of whom have risen to high administrative positions. More than any other single institution in India the college has contributed to the organisation and orderly management of the great forest estate of India.

RULES FOR THE RANGER COURSE AT THE INDIAN FOREST RANGER COLLEGE, DEHRA DUN, U. P.

(Issued 1940, subject to such alterations as may from time to time be ordered.)

SECTION I.—CONSTITUTION.

Subject to the sanction of the Government of India, the Inspector-General of Forests controls the administration of the college.

2 The superior staff of the college consists of:—

- (1) The President, Forest Research Institute and College,
- (2) The Director of the college,
- (3) Instructors,
- (4) The Research staff and their assistant.

3 The President is responsible for the general administration of the college and the control of the accounts. Subject to the control of the President, the Director is in administrative charge of the college and is responsible for:—

- (i) arranging the courses of studies,
- (ii) the maintenance of discipline,
- (iii) the supervision of the buildings, quarters, gardens and grounds, and
- (iv) correspondence.

SECTION II.—THE COURSE.

4. The course at the college lasts two years. It is primarily designed to train men for the posts of rangers and deputy rangers in the subordinate forest services and in Indian states, British colonies and foreign countries and for private employment. The syllabus is given in "Syllabus for 24 months Rangers' Course" published by the Forest Research Institute and College.

SECTION III.—ADMISSION RULES.

Categories of Students.

5. The students of the college are classified into four categories, namely:—

- (1) Students already in Government service.
- (2) Government probationary students, stipendiary or non-stipendiary,
- (3) Students deputed by Indian states, British colonies, etc.,
- (4) Private students.

Government probationary students are those who have been selected by any government in British India for appointment to its forest service after qualifying at the college.

Private students are those who do not hold appointments in any forest service, or who have not entered into an agreement to serve any government or administration. No private student will be admitted unless in possession of a guarantee of employment.

Allotment of Studentships.

6. The President shall decide the number of students of each category to be admitted each year. After consulting the various administrations, he shall decide the number of studentships to be allotted to each. The President will communicate this number to the various administrations not later than 15th July.

7 When a local government, Indian state or British colony cannot utilise the full number of studentships allotted, it should immediately inform the President so that the vacancies may be filled up with other candidates in time to permit of the prescribed preliminary training.

Rules for Candidates in Category 1.

8. Candidates in government service who may be deputed to the college will be ordinarily:—

(a) Forest rangers who have not previously obtained the Higher Standard Certificate of the college.

They must pass the qualifying examination (See Rule 14) before they are admitted. They must not be above 30 years of age on entering the college.

(b) Other members of the subordinate forest service (deputy rangers, foresters and other subordinate officials).

They may be deputed provided that:—

(i) they have been in the subordinate forest service for not less than 2 years;

(ii) they are under 25 years of age on entering the college.

NOTE.—The President may relax the two foregoing provisions.

(iii) there is accommodation at the college,

(iv) they pass the qualifying examination (See Rule 14).

Forest rangers and other members of the subordinate forest service will not be required to undergo the practical training referred to in Rule 16.

(c) Indian non-commissioned officers of His Majesty's Army (See Appendix I).

Rules for Candidates in Categories (2), (3) and (4).

9. *Age.*—Candidates must be not less than 18 years nor more than 25 years of age on 1st April of the year in which they are admitted.

The President may grant exemptions from this rule.

10. *Submission of applications.*—The selection of students of category (2) rests with the provinces and is governed by rules prescribed by the Provincial Governments.

Where rules to the contrary have not been prescribed, applications must be sent to a conservator of forests either direct or through a divisional forest officer or through a collector or officer-in-charge of a district.

Applications from candidates from Indian states [category (3)] must be endorsed by a responsible official, such as an Agent to the Governor-General, a Resident, a Political Agent, a Superintendent or a Deputy Commissioner to ensure that the studentships asked for are based on the actual requirements of the state.

Applications from candidates from British colonies [category (3)] must be sent to the Governor of the colony.

Applications from private students [category (4)] must be submitted, together with the guarantee of employment referred to in Rule 5, to the President through the head of the forest department in the province or state concerned, or through a collector or officer-in-charge of a district.

11. *Certificates.*—All applications must be accompanied by the following certificates:—

(a) A certificate that the candidate is of Indian domicile in accordance with the "Provisions for the Determination of Domicile" given in Appendix II, except candidates from British colonies, or foreign countries.

(b) A certificate of age

(c) A health certificate in the form prescribed by Article 49 of the Civil Service Regulations, 5th Edition, signed by a civil surgeon or such other medical officer as may be approved by the President and testifying to the candidate's sound hearing and general physical fitness for a rough outdoor life in the forest department, and to the fact that he bears on his body marks of successful vaccination or of small pox. For candidates from British colonies or foreign countries, an equivalent certificate must be submitted.

(d) A certificate of respectability and good moral character from two or more persons of acknowledged social or official position.

The certificate (c) and (d) must have been given not more than 9 months previously.

Any person giving certificates under (c) and (d) may mention anything further to the credit of the candidate.

(e) A certificate of having passed the Intermediate Examination of any recognised Indian university with one or more of the following subjects:—Mathematics, Physics, Chemistry, Botany, Zoology.

A certificate of having passed any other examinations of an equivalent or higher standard will be admissible.

The President is authorised exceptionally to admit candidates with educational qualifications inferior to those prescribed above provided that the candidates pass the qualifying examination referred to in Rule 14.

12. Subject to any rules prescribed by Local Governments, the conservator who receives an application may reject it without assigning any reasons. If he accepts it, the applicant, if a candidate for government service, should be interviewed by a conservator, if possible, or otherwise by some officer of the Indian Forest Service, who should record his opinion on the suitability of the candidate.

13. Candidates approved by the Local Governments for government studentships, by the State authorities for studentships of Indian states and by the President for private studentships will be eligible to sit for the qualifying examination prescribed in Rule 14.

NOTE.—In view of the high percentage of failures in the qualifying examination, it is strongly recommended that for each vacancy which it is desired to fill several candidates should be allowed to compete in the qualifying examination.

14. *Qualifying Examination.*—Before admission to the college, every candidate shall be required to pass a qualifying examination in the following subjects:—

- (1) Dictation of a piece of ordinary English prose.
- (2) An essay to be written in English in one of several simple subjects.
- (3) Mathematics (Arithmetic, Geometry and Algebra). The standard of this paper will be that of matriculation.
- (4) General knowledge. This will include elementary science, geography and current events.

Twenty per cent. of the marks allotted for Dictation will be given for handwriting.

In order to qualify, a candidate must obtain at least 50 per cent. of the marks in each subject.

This examination will be held simultaneously at all or any of the following centres:—Abbottabad, Angul, Calcutta, Dehra Dun, Gauhati, Nagpur, Karachi, Lahore, Lucknow, Madras, Quetta, Ranchi and Srinagar (Kashmir). Supplementary centres may, if necessary, be sanctioned by the President. The papers will normally be marked at the Indian Forest Ranger College.

Provinces may conduct a competitive examination of a standard not lower than that of the qualifying examination and this will be accepted.

Candidates will be required to defray their own travelling expenses for the qualifying examination.

No fee will be charged.

The examination will be held in the first week of October of the year previous to that in which admissions will be made.

The President may relax any of the conditions in this rule (Rule 14).

15. *Selection of Students.*—The results of the examination for candidates of categories (1), (2) and (3) will be communicated by the President to the provinces and states concerned. The Local Governments and Indian states shall select their students for training at the college from among the candidates who have passed in the qualifying examination.

16. *Preliminary Training.*—Before joining the college, all selected students of categories (2), (3) and (4) must undergo a course of practical training in the forests lasting at least 3 months. This need not be in the province or state of domicile. Before they are allowed to join the college, such students must produce certificates signed by the divisional forest officers under whom they served and countersigned by the conservator of the circle, or by the State authority for students from Indian states, that they have undergone the course of practical training satisfactorily and are likely to make useful forest officers.

If through no fault of his own, a student fails to complete the minimum practical course, the President may exempt him, provided a conservator of forests has certified that he is likely to make an efficient forest officer.

NOTE.—A Local Government may make special rules for the selection of its students whether of category (1) or (2) but such rules must not conflict with the college rules. Candidates should apply to the head of the forest department in the province for any special rules made by the province.

SECTION IV.—STUDIES, TERMS AND EXAMINATIONS.

17. *Subject.*—The subjects taught during the course are the following:—

I.—Main Subjects.—

(A) *Forestry.*—

(1) Silviculture, Mensuration, Management and Protection.

(2) Forest Utilisation.

(B) *Other Subjects.*—

(3) Botany, both theoretical and practical, with special reference to forest systematic botany.

(4) Forest Engineering.

(5) Surveying and Drawing

II.—Accessory Subjects.—

(6) Mathematics: Arithmetic, elementary Algebra and Geometry, in so far as they affect Forest Mensuration.

(7) Elementary Physical Science including elementary Geology and Soils.

(8) Forest Law: Indian Forest Act, Land Acquisition Act, Cattle Trespass Act, Indian Penal Code, Code of Criminal Procedure, Law of Evidence.

(9) Forest Accounts and Procedure: Departmental organisation, especially management of a range.

18. *Tours.*—Tours in selected forests for practical instruction constitute an integral part of the course.

19. *Terms.*—The college terms are approximately as follows:—

Summer Term.—1st April to 14th August.

Summer Vacation.—15th August to 30th September.

Autumn Term.—1st October to 19th December.

Christmas Vacation.—20th December to 4th January.

Winter Term.—5th January to 31st March.

The terms are the same in both years of the course, but a short vacation not exceeding two weeks will be allowed in the second year between the winter and summer terms, that is from 1st April to 14th April.

The terms include lectures at the college and tours.

20. *Examinations.*—Annual examinations will be held in March as follows:—

I.—*First year examinations.*—

(1) Forestry.

(5) Mathematics.

(2) Forest Utilisation.

(6) Physical Science.

(3) Botany.

(7) Survey and Drawing.

(4) Forest Engineering.

II.—*Final examinations.*—

(1) Forestry.

(4) Forest Engineering.

(2) Forest Utilisation.

(5) Forest Law.

(3) Botany.

(6) Forest Accounts and Procedure.

In addition to the annual examinations, terminal examinations and tour examinations will be held in such subjects and on such dates as the Director may decide.

In order to pass a student must obtain 50 per cent. in a main subject and 40 per cent. in an accessory subject.

Students will not be permitted to take the first year examinations until they have been through the course. Each student must take all the subjects. If he fails in more than two main subjects, he will be required to leave the college. Students who fail in only one or two main subjects will be required to pass in an examination in the subjects in which they failed six months later.

No student will be admitted to the final examinations unless (1) he has already passed the first year examinations and (2) the Director can certify that he has satisfactorily completed an approved course of practical work in Forestry, Survey and Forest Engineering, and that he has passed a practical test in the use of surveying instruments. Students must take all the subjects.

Marks will be allotted for the two year course as follows:—

(1) Forestry	1,000	(8) Forest Law	200
(2) Forest Utilisation	300	(9) Accounts and Procedure	200
(3) Botany	500	(10) Tours and Tour Examinations	800
(4) Forest Engineering	500	(11) Conduct	500
(5) Survey and Drawing	400		
(6) Mathematics	100		
(7) Physical Science	200		
		Total	4,700

Conduct marks will be awarded for punctuality and regularity in attendance, behaviour and discipline and for keenness and proficiency in games and sports, including the Marathon race.

21. *Certificates*.—On successful completion of the two year course, one of the three following kinds of certificates will be awarded:—

(i) *Honours*.—Not less than 50 per cent. of the marks given for each subject and not less than 75 per cent. of the total number of marks.

(ii) *Higher Standard*.—Not less than 50 per cent. of the marks in main subjects and not less than 60 per cent. of the total number of marks.

(iii) *Lower Standard*.—Not less than 40 per cent. in Forestry and not less than 45 per cent. of the total number of marks.

22. *Failure to obtain a certificate*.—Should any student fail or be unable to appear at the final examinations, he will not be allowed to appear in any subsequent final examination unless the President permits him to follow for a second time the second year course.

The Inspector-General of Forests may relax this rule should he deem it necessary.

23. *Prizes*.—The following prizes will be awarded to qualified students:—

(1) Honours Gold Medal.—To the student who gets the highest total number of marks

(2) Fernandez Gold Medal for Forest Utilisation.

(3) Silver Medal for Forestry.

(4) Silver Medal for Forest Engineering.

(5) Silver Medal for Botany.

(6) McDonnell Silver Medal.—To the best student from the Punjab or Kashmir.

(7) William Prothero Thomas Prize.—To the best practical forester.

(8) "Indian Forester" Prize.—To the best student who has received no other prize.

(9) Director's prize.—To the second best student who has received no other prize.

(10) Inspector-General's cup.—To the winner of the Marathon race.

(11) Hazarika Memorial Prize.—To the student who does best in tour examinations.

All prizes, whether given by government or other donors, will be awarded by the Inspector-General of Forests who may withhold any medal or other prize.

NOTE.—No student will be awarded more than four prizes excluding the Marathon prize.

SECTION V.—STIPENDS, FEES AND ALLOWANCES.

24. *Government students of category (1)*.—Students who are already in government service will draw the pay of their grade or a stipend of Rs. 50 per mensem, whichever is greater, and travelling allowance at Government of India rates for officers of their grade as permissible under the Supplementary Rules.

25. *Government Students of category (2)*.—The grant of stipends and scholarships to government probationary students rests with the local governments deputing them. Where a stipend of less than Rs. 50 per mensem is granted,

it will be for the local government to collect from the parent or guardian of the student the difference between Rs. 1,200 and the total value over the 24 months' course of the stipend allowed by the local government, and to remit the sum to the Director before 15th April of the first year of the course. Similarly where no stipend is granted at all or where the payment of a scholarship is conditional on the candidate successfully completing the course, a sum of Rs. 1,200 will be collected from the parent or guardian of the candidate by the local government and remitted to the Director as above. The underlying principle is that a sufficient sum of money should be held in deposit at the college to make up together with the monthly stipend a monthly pay of Rs. 50 and that sum of money should be collected by the local government. When the monthly stipend allowed by local government is Rs. 50 or more, the question of a deposit does not arise.

It is urged that deductions from the monthly stipends of students on account of recoveries of advances granted to them should be postponed till after completion of the course if the effect of the deductions would be to reduce the net stipend payable to less than Rs. 50 per month.

26. Government probationary students of category (2) are ordinarily not entitled to travelling allowance, and are expected to defray their living expenses while on tour. But local governments are strongly recommended to grant actual expenses of journeys, which are estimated to amount to Rs. 600 for the whole course for each student. If however, a local government decides not to grant actual expenses of journeys to its students, a sum of Rs. 600 shall be collected by the local government for each student deputed, from the parent or guardian of the student, and remitted to the Director before 15th April of the first year of the course.

27. *Students from Indian States, category (3).*—Indian states deputing students to the college shall, prior to the admission of their nominees, deposit with the Director for each student:—

(1) Rs. 1,200 for the monthly payment of Rs. 50 to the student to meet the ordinary expenses of living.

(2) Rs. 600 for the actual expenses of travelling while on tour

Total for the course = Rs. 1,800.

These sums are intended to meet expenses for the whole two years' course and are in addition to the fees prescribed in Rule 29. If the actual travelling expenses exceed the amounts given above, such further sums shall be deposited as the President may demand.

28. *Private Students, category (4).*—Prior to the admission of a private student, his parent or guardian must deposit with the Director Rs. 1,800 to cover the cost of living and travelling expenses. At the same time he must satisfy the President that he is willing and able to defray all the training expenses of the student.

NOTE.—There is no guarantee that a monthly stipend of Rs. 50 will cover the whole cost of living, etc., at the college.

29. *Fees.*—The training fees are fixed at Rs. 1,500 per annum, payable to the President, in two equal instalments on April 1st and October 1st by the deputing authorities for students of categories (1) to (3), and by the parents or guardians for students of category (4). The fees will cover the cost of tuition, lodging, light, water and other services at headquarters for the two years. No fees will be refunded.

30. *Caution Money.*—Within 15 days of their admission, all students, except those who are already in government service, shall deposit as security, a sum of Rs. 100 pledged to the President in the Dehra Dun Head Post Office.

SECTION VI.—GENERAL RULES.

31. *Cost of Equipment.*—Uniforms, books and camp outfit must all be paid for in cash. All necessary equipment must be obtained from the college contractors or as the Director may direct. It is estimated that an initial expenditure of Rs. 405 will be incurred, and students must bring this sum with them to Dehra Dun, in addition to the caution money prescribed in Rule 30.

32. *Quarters.*—The Director will allot quarters in the hostels to students on their arrival in Dehra Dun. All students must abide by such orders as the Director, or other officers authorised by him, may issue to ensure cleanliness and sanitation.

No student is allowed to be absent from his quarters after 10 p.m. without the permission in writing of the Director, and any student found absent after that hour will be liable to punishment which may amount to dismissal. All lights in the college must be out between 10-30 p.m. and 5 a.m.

No visitors will be allowed to sleep in the college without the permission of the Director.

No dogs are allowed in quarters, nor may dogs, motor cars, motor cycles, horses or fire-arms be brought inside the college grounds or taken on tour without the permission of the Director.

Breakages of furniture, etc., in the college buildings must be paid for by the students, who are responsible for the acts of their servants.

Such subsidiary regulations as may be necessary will be made by the Director from time to time.

33. *Mess.*—Students may be required to take their meals at a common mess, catering separately for vegetarians and non-vegetarians. Pending the formation of a common mess, students will be allowed to range themselves into several messes, for each of which a separate cook-room will be provided. Students will not be allowed to have their meals in their own living rooms.

34. *Uniforms.*—All students must wear the college uniform, which consists of a khaki drill tunic and shorts, two metal badges, khaki twill shirt, khaki tie and khaki pugree of prescribed pattern. Khaki hats may be worn instead of the pugree, except on ceremonial occasions. Woollen khaki putties and brown leather boots will be worn on tour. Khaki stockings and brown leather shoes will be worn in Dehra Dun.

Uniform must always be worn while on duty.

35. *Uniform and Camp Equipment.*—The uniform, sports dress and blazers must be obtained through such agency as the Director may appoint.

Each student requires —

- | | |
|--|------------------------------|
| (1) A bicycle | (4) A small camp table |
| (2) A small tent. | (5) A camp chair or "morah". |
| (3) A camp bed with mosquito fittings and curtain. | (6) A small axe. |
| | (7) A khukri. |
| | (8) A hand lens. |

36. *Maintenance of Uniform and Equipment.*—All articles of uniform and equipment must be maintained in good order.

37. *Books and Instruments.*—The books and instruments required by each student will be indicated by the Director from time to time. The articles should be purchased from the college if in stock. No article will, however, be issued from stock except on cash payment or on the order of the Director.

Certain books and surveying instruments are issued on loan if available. Students using them will be responsible for their safe custody and return.

38. *Marriage of Students.*—No student shall marry while at the college. A breach of this rule will render the student liable to dismissal.

39. *Leave.*—During term no student may leave Dehra Dun without the written order of the Director. Nor may students while in camp leave the camp headquarters without the written order of the officer-in-charge. Subsidiary leave rules will be made by the President from time to time.

40. *Removal for incapacity or other reasons.*—The President may at any time remove any student for incapacity, lack of due diligence and application, gross breach of discipline, chronic indebtedness or moral turpitude.

41. *Punishment.*—The following punishment may be inflicted by the Director:—

Gating; reduction of conduct marks; censure.

Only the President is empowered to dismiss a student. He will intimate dismissal to the local government, Indian state, parent or guardian concerned.

42. *Annual Reports*.—Annual reports on the work and conduct of each student, showing marks obtained, will be issued by the President at the conclusion of each academic year and will be sent to the authorities concerned.

43. *Library and Museums*.—The library and museums at the Forest Research Institute are available for the use of students under such rules as the President may make from time to time.

44. *Athletic Sports and Games*.—Games are compulsory at the college. The gymnasium and the tennis courts will generally be available during recreation hours for the use of students under such rules as the Director may make. Cricket, hockey and football games and matches are arranged.

45. *Physical Training*.—All students will undergo a course of physical training while in residence at Dehra Dun.

APPENDIX J.—RULES FOR THE ENTRY INTO THE FOREST DEPARTMENT AS RANGERS OF NON-COMMISSIONED OFFICERS OF HIS MAJESTY'S INDIAN ARMY.

Government of India, Department of Education, Health and Lands' Resolution, No. 508-F., dated Simla, the 19th April, 1928.

As certain alterations are necessary in order to bring up-to-date the rules promulgated with the late Revenue and Agriculture Department Resolution No. 32-F.-236-2, dated the 22nd October, 1910, and No. 8-105-2, dated the 15th June, 1914, for the entry into the Forest Department as Rangers of Indian Non-Commissioned Officers of His Majesty's Indian Army and Indian State Forces, the following rules are issued in supersession of those contained in the resolutions mentioned above.

A.—Indian Non-Commissioned Officers of His Majesty's Indian Army.

I. Any such officer who is recommended for the purpose by his Commanding Officer may apply to a Conservator or a Chief Conservator of Forests in the province in which he desires to be employed for permission to follow the course of instruction in the Ranger class at the Indian Forest Ranger College, Dehra Dun, with a view to securing after successfully passing through the College and obtaining a certificate, an appointment as Forest Ranger in the Subordinate Forest Service.

II. The Conservator to whom application is made must be satisfied —

(a) that the candidate will not be more than 30 years of age when he enters the College;

(b) that he has been sufficiently well-educated, especially in Mathematics and English, to be able to follow the College course with advantage and to obtain a Ranger's certificate; and

(c) that he is of good constitution and active habits, and possesses fair ability and powers of observation as well as such physical qualifications as are required for a good Forest Officer.

III. If the conditions in the preceding rule are satisfied and the candidate is accepted by a Local Government for an appointment in the Subordinate Forest Service, he may be admitted to the College, and be allowed to receive from the deputing authority the stipend and travelling allowance admissible to

*Conservator of Forests, Assam, Shillong.
 Conservator of Forests, Bengal, Dajching.
 Conservator of Forests, Bihar, Ranchi.
 Conservator of Forests, Central Circle, Central Provinces, Nagpur.
 Conservator of Forests, Eastern Circle, Central Provinces, Nagpur.
 Conservator of Forests, Western Circle, Central Provinces, Nagpur.
 Conservator of Forests, North Western Frontier Province, Abbottabad.
 Conservator of Forests, Orissa, Angul.
 Conservator of Forests, Eastern Circle, Punjab, Lahore.
 Conservator of Forests, Western Circle, Punjab, Lahore.
 Conservator of Forests, Anti-Erosion Circle, Punjab, Lahore.
 Conservator of Forests, Eastern Circle, United Provinces, Naini Tal.
 Conservator of Forests, Western Circle, United Provinces, Naini Tal.
 Conservator of Forests, Working Plan Circle, United Provinces, Naini Tal.

Government probationary students under Rules 25 and 26 of the Rangers' course rules. While at the College, with the exception that he need not attend drills, he will, in all respects, be subject to the rules for the time being in force, a copy of which can be obtained from the Director of the College or the President of the Forest Research Institute and College, Dehra Dun.

IV. On obtaining a certificate at the conclusion of the Ranger course, the candidate will be eligible to be appointed as Ranger. On being so appointed, he will be subject, as regards future promotion, to the regulations of the Forest Service for the time being. As regards other conditions of service, the candidate will, after the expiry of the period of three months' absence from his unit be transferred to India Unattached List under the conditions laid down in Regulations for the Army in India, Appendix XXVII, paragraph 229. On obtaining an appointment to the Forest Department, if he elects to remain on the Unattached List, his pension will be assessed under Pay and Allowances Regulations of the Army in India, Part II, paragraph 508. If he elects to take his discharge from the Army, his pension will be regulated under Articles 856 and 357 of the Civil Service Regulations, and he will also be permitted to count 12 months of his period of instruction at the Indian Forest Ranger College as service for pension under those Regulations.

B.—Indian Non-Commissioned Officers of the Indian State Forces.

I An Indian Non-Commissioned officer of the Indian State Forces shall be eligible for admission to the Forest Department as Ranger provided he can obtain a nomination for an appointment under a Local Government or Administration.

II Rule IV of the Rules above, so far as it relates to conditions of military service, will not apply to candidates from the Indian State Forces.

2 These rules do not apply to the provinces of Madras and Bombay.

APPENDIX II.—PROVISIONS FOR THE DETERMINATION OF DOMICILE.

1. A person can have only one domicile.

2. The domicile of origin of every person of legitimate birth is in the country in which at the time of his birth his father was domiciled or, if he is a posthumous child, in the country in which his father was domiciled at the time of the father's death.

3 The domicile of origin of an illegitimate child is in the country in which at the time of his birth his mother was domiciled.

4. The domicile of origin prevails until a new domicile has been acquired, and a new domicile continues until the former domicile has been resumed or another has been acquired.

5. A person acquires a new domicile by taking up his fixed habitation in a country which is not that of his domicile of origin.

Explanation 1.—A person is not to be considered as having taken up his fixed habitation in a country merely by reason of his residing there in His Majesty's civil or military service or in the exercise of any profession or calling.

Explanation 2.—A person does not acquire a new domicile in any country merely by reason of residing as part of the family or as a servant of any ambassador, consul, or other representative of the Government of another country.

6. The domicile of a minor follows the domicile of the parent from whom he derives his domicile of origin.

Provided that the domicile of a minor does not change with that of his parent if the minor is married or holds any office or employment in the service of His Majesty or has set up with the consent of the parent in any distinct business.

7. After marriage a woman acquires the domicile of her husband if she had not the same domicile before, her domicile during the marriage follows the domicile of her husband:

Provided that if the husband and wife are separated by the order of a competent court or if the husband is undergoing a sentence of transportation, the wife becomes capable of acquiring an independent domicile.

8. Save as otherwise provided above a person cannot during minority acquire a new domicile.

9. An insane person cannot acquire a new domicile in any other way than by his domicile following the domicile of another person.

10. If any question arises as to the domicile of any officer at the time of his appointment, the decision thereon of the Secretary of State in Council in the case of persons appointed by him, of the Governor-General in Council in the case of persons appointed by him, or of the local Government in the case of persons appointed by them shall be final.

Mr. Howard.—"I hope you have read what has been written by Mr. Mohbs and Mr. Ranganathan. They will tell you themselves when they come here what their principal points are. What I would like to call your attention to is that students both of the Superior course and the Ranger course are finding it increasingly difficult to live here on their stipends and although I know perfectly well that you cannot commit your governments to the payment of money, the fact remains that their case is a true one. The superior course man only gets Rs. 100 monthly and the Ranger only Rs. 50 monthly as stipends. As you know very well, governments themselves have recognised that people do need an increase in their emoluments. For instance they have granted dearness allowance to their subordinates. If a clerk getting say Rs. 50 per month is granted a dearness allowance of Rs. 7 a month, it must be said in fairness that the Ranger students should also get an increase in order to meet expenses which they cannot avoid. Whether you propose to recommend to your governments that this should be given from the public funds or from other sources is a matter for the governments concerned, but the fact remains that these students cannot any longer make both ends meet on their present stipends. That is the first thing which I would like to bring to your notice."

"To come to the courses themselves. Are you satisfied with the courses or do you suggest any changes? You, having now had students from these classes for several years, ought to be able to judge whether they are being trained in the way that you really want. For instance, as regards the Superior class training are you getting the type of lads you require? Do you think the course is too theoretical and do you think it ought to be made more practical? The same applies to the Ranger's course. Do you think that the Rangers course is too similar to the training of the Superior class? Or do you think that is not similar enough? On all these points I should like to hear your opinion and to get a lead from you. Lastly you will find that Mr. Mohbs has revised the rules of the Superior class. He will call your attention to things that matter in them. When the rules were first drawn up we had no experience whatsoever. In practice we found that the rules as drawn up could not be followed in their entirety. What Mr. Mohbs has now done is to bring the rules into line with what is in fact being done. You cannot possibly discuss and pass resolutions on all the rules. But there is a clause at the beginning which says that the Board of Forestry has to approve them. I suggest that you leave to Mr. Mohbs and myself the actual wording of the individual rules that are to be framed in accordance with your wishes."

Chairman.—"There is a point that occurred to me since I have been here. It seems to me some thing in the nature of an anomaly that there should be a Rangers College and also a Superior Service College. I have not been able to find any better name for it except that I may call it Superior Service College. The question that I wish to put to you is whether it is possible to link up both together Rangers College acting as a School and the Superior Service College as a College in the proper sense of the word, that is to say, we should have an arrangement under which candidates could graduate from the College. It should be possible to link up the Forest College with a University so that the College could give a Forest Degree and the Rangers College then would become a school which would feed the College.

Then there is the question of admission. So far as an outsider can see it, it seems to me that the only difference that exists at present is, that those who are admitted to the Rangers' College should have taken intermediate pass and those who are admitted to the Superior Service College should have a degree. It may give a better class of officers if from the Rangers' class selection is made of the men who are likely to make officers and who pass through a competitive examination before they enter the College. It seems to be necessary to separate the College from the School, and to arrange for the students to have a University degree. In that case the advantage would be that a student who receives 4 years' instruction can be given one year's practical training in forestry. It would give a better class officer than we at present get. The question for you to decide is as Mr. Howard has put it to you, are you getting the kind of officers you need and if not, is it possible to improve our system of education to keep pace with modern times so that science and practice should combine together and produce the best possible men? From my point of view I feel that Foresters are our national wealth and to maintain and increase this wealth you need the best possible officers you can get.

"Mr. Howard also raised the question of funds. I am not speaking as a Member of the Government. I do not wish to commit the Government in any way, but I do feel that it will be possible to find funds by putting a small surcharge on rail-borne timber and create a permanent fund, to provide both for research and for the training of men here. That is a question upon which you can also express an opinion. If you think the problem cannot be discussed in the short interval of half an hour, it may be useful to appoint a small sub-committee that could examine the whole position and prepare a scheme to improve our system of instruction and to find funds."

Mr. D. C. Mobbs.—At the request of the Chairman Mr. Mobbs, in explaining his proposals, said —

"I think Sir, the first thing is to decide on the Hon'ble Member's proposal whether or not it is necessary or desirable to train men first in the Ranger College and then send them to the Indian Forest College for superior training. It seems pointless to discuss or revise the College rules if the system of training is to be changed to that considerable extent. The proposal to put in first two years at the Ranger College and then two years at the superior college might produce quite good results. In fact I should think even 12 years at the superior college might suffer after two years at the Ranger College. But there are, I think, certain weighty objections. The first is that the proposal would allow men to enter the superior college with the same qualifications as prescribed for the Ranger College. Now in a review of the status of the Superior Forest Service you require men of wide general education who can take their place among men of similar Services in other directions. The possession of an Honours Degree does ensure to some extent that you get men of sufficiently wide general education."

"Secondly I am not sure that you will get much of right type coming forward. If you have the men trained first at the Ranger College it means that roughly one-third might come forward to the superior college and two-thirds would have to go out as Rangers. That means that a man has a one to two chance of becoming an officer and a two to one chance of becoming a Ranger. A Ranger starts at Rs. 50/90 and I think the right type of man required for the superior course will not come forward if he has a two to one chance of being left as a Ranger."

"The cost of the course might also affect matters. If a man has to spend four years, two at the Ranger College and then two at the superior college, it would be even more expensive for him than the present system."

"A further point is that possibly it might make classes at the Ranger College too large. Already, I think, Mr. Ranganathan will agree that his classes are larger than is really convenient for efficient practical training, and if you go on enlarging the classes by the addition of extra students, I think it

would make conditions even worse. That would mean probably that he would have to increase his staff, which would counterbalance any saving so far as my college is concerned."

"These are the chief objections to this scheme, and I think perhaps it would be better if this matter were discussed first."

Chairman.—"I have no cut and dried scheme. I am just trying to find ways of improving our system of Education with a clear demarcation between the school and the college."

Mr Howard.—"One of the things that Mr. Mobbs and Mr. Ranganathan have frequently referred to and which is down in Mr Mobbs' note is that he provides for what is quite a new thing, a special short course by deputation to the college of Ranger and class II officers under 30 years of age. The idea is that a Ranger who has done really well in the lower class should be put forward to his Government for approval and that that Ranger should then be permitted to go on immediately to the second year's course in the superior class so that he may gain the higher diploma and straightaway become a gazetted officer. We have precedents for that. I might cite the case of Mr. Dillon from the Punjab. In his case Mr. Ranganathan recommended that this boy should be given a chance to become something more than a Ranger. The Punjab Government agreed. He did brilliantly as a Ranger and then had a year in the superior class and then went out as a gazetted officer. Well, that is what Sir Jogendra Singh visualises except that instead of being an exceptional thing, he visualises it as a regular thing. On this particular point you might possibly debate first instead of debating Mr. Mobbs' proposals as a whole."

Mr. C. R. Ranganathan.—"Sir, I am in general agreement with Mr. Mobbs in what he has said on the question of training Rangers and gazetted officers in one Institution by adding a two-years' extra training course. In addition to the arguments which he has put forward there is the question of communal representation. If we are going to select men for gazetted posts from amongst the best Rangers it will not be possible to ensure that representation of the communities which the Provinces might desire."

"A further point that I would like to bring forward is the question of discipline. I think the Board will agree that for the purpose of discipline it would be an advantage if the training of officers is separated from the training of Rangers. I think also it would be an advantage if those who become Rangers were not branded with the mark of failure to achieve gazetted officers' posts as they would be if we adopted the scheme under which we selected our gazetted officers from amongst the best Rangers."

"Apart, from this, I have suggested in my paper that the Ranger College ought to be included in the field of recruitment for research as a normal thing, that is to say, a man who passes out of the Rangers College, no matter whether he is a graduate or not, if he fulfils the condition of passing out with a certain amount of distinction, then he must be considered by the provinces for selection to gazetted officers' posts immediately."

In reply to a question by Mr. Simmons, whether the Rangers course would cater for the P.F.S. the *Chairman* remarked that it would be better to consider the education aspect under this item and leave the needs of the Provinces to themselves.

Mr. Hall said that there were practical difficulties. Government insist that the students who attend these courses should be appointed after consultation with the Public Service Commissions. The U. P. Government might not agree that because a student happens to have done well in the Ranger college he should automatically go on to the Provincial Service. After all, the Public Service Commission and the Government take into consideration more than mere educational qualifications in this matter.

Mr. Mobbs.—"In my revised rules I have provided that we should accept Rangers providing they are 30 and have the certificate of the Ranger College. If they have an Honours certificate of the Ranger College I am prepared to

take them for only one year that is for the second year of the superior course. 'If they do not possess an Honours certificate then we should take them for the full two years course.'

"As regards educational qualifications I have put down the same qualification as for other students, with a special note that this may be relaxed. It may frequently have to be relaxed, but the rule will indicate the ideal that we aim at. There was also on the agenda the further subject of training of Rangers to be promoted who are over the age of 30 years so that both Rangers under 30 and Rangers over 30 are to be catered for."

Mr. Harlow — "I have to say one thing which will probably be considered as a revolutionary proposal and it is very seriously wrapped up with the question of the recruitment of gazetted officers and of Rangers. My own experience has been that it is very easy to recruit the type of men we want for the Rangers Course and it is very difficult to recruit the type of men we want for the Superior Course. A few years ago the standard of education required for the Rangers Course was Matriculation and it has been very easy to raise it to the standard of Intermediate. At present from my own experience at the last selection, we had no great difficulty in selecting the right type of man and the difficulty will be no greater if we raise the educational qualifications to that of a pass degree. In fact, I had 10 to 12 applicants who had degrees. At the other extreme we got the Superior Service class, and in order to get my four students last year I had to apply to the Inspector General, that is to the President, for relaxation of the qualifications and then only with considerable difficulty I got the four candidates who were to be selected by the Public Service Commission. I think that the same thing is going on and will continue to go on with regard to the Rangers' Class. In a few years time we can get all we want from among graduates. If at the same time we have to go on reducing the standard for the Superior Class we shall get into a very ridiculous situation. What I feel myself is that Indian education is at present in a state of transition and that in the Nagpur University at present Honours students are few. In some years time 10, 15 or 20 years, Honours students will be fairly common, almost as common as they are at present in an English University. When we reach that stage it seems to me that there will be no justification whatever for two technical courses here at Dehra Dun. We can combine the two and if Provinces agree we can select from among those who have passed the combined course. We shall then get a very high standard of applicant for the Rangers post. That leads, as I said, to this revolutionary proposal that eventually we must look forward to the time when there will be only one course of training for university candidates for the various services, and that is what they have got in every country in Western Europe and in America, and that is I think what India must come to also, whether it takes 10, 15 or 20 years."

The Chairman said that his impression had been that the Public Service Commission selected candidates only when they were qualified but the position seems to be that the Provinces really selected candidates first and then sent them for training with a promise of appointment immediately they pass the examination. That position, he said, would have to be altered.

Mr. Solters asked whether the Rangers from the Provinces of Bombay would be accepted for the short course of one year if they came from their local college.

Mr. Mohbi was prepared to take candidates from Bombay local college as an experiment.

Mr. Rangaswami was in favour of the old system of the Rangers being promoted to the Superior staff departmentally. He did not see that there was any necessity for a man to go to Dehra Dun again before such promotion. In the past his experience was that men who entered as Range Officers had been promoted to gazetted rank and if a man reached the gazetted rank after having done very well in his service it was not at all necessary for him to go all the way to Dehra Dun to undergo training again.

Mr. Simmons agreed with the point of view put forward by Mr. Rangaswami. He emphasised that it would be difficult for a man after having put in many years of service to go back to school again and consequently he might not be able to follow the course but that did not necessarily mean that he was not fit for promotion to gazetted rank.

Mr. Harlow also agreed with the opinion of Mr. Simmons, pointing out an instance from his own province.

Mr. Morehead was in favour of the existing arrangement continuing.

Mr. Petty adverted to the point raised by Mr. Rangannathan about communal representation and stated that it was difficult to recruit the proper type of man on a communal basis though this was the method of recruitment in Sind.

Mr. Dyson said that a Ranger student who distinguished himself at the Rangers' College should not be given direct promotion and further training as a gazetted officer. He should return to his province and prove his worth in practice. He would have adequate chances of promotion in due course, and this should be given without sending him to Dehra Dun for further instruction.

Sir Harold Glover referred to the opinion of Mr. Mobbs on the Punjab experiment in the case of Mr. Dhillon which he said was very successful.

Hon'ble Pir Illahi Bakhsh Nawaz Ali was in favour of the continuation of the present arrangement with the proposed alteration that Rangers who came with Honours might be given a chance to go to the Superior Class. He at the same time was personally of opinion that if any province desired that any Ranger who has been doing well should be sent to Dehra Dun although he does not possess an Honours degree, he should also be permitted to go over and be admitted in the third year so that he might go as a Superior Officer. He was not much impressed with combining the two courses since the combined course would be a three years course instead of a two years course for the Superior Officers. He also pointed out the additional expense of the longer course which might prevent some of the good type of men turning up. He therefore thought it better to continue the present arrangement.

Mr. Coffey said that in Bengal they would rather adhere to the present system of separate courses for gazetted officers and Rangers, and if there was a really good Forest Ranger they would be glad to give him a chance to become a gazetted officer because sometimes it was difficult to get really suitable men for gazetted officers' posts.

Mr. Simmons reiterated his view that, simply because a Ranger who was otherwise qualified, was not capable of following a further course of training after having put in several years service, he should not on that score be debarred for promotion, to gazetted rank. Mr. Simmons had in mind Rangers over 30 years of age.

Mr. Mobbs intervened to say that they had not taken people over 30 years and his proposal was not to take Rangers over 30 years. What he had actually provided for was an additional proposal that for people who were over 30 years there should be a separate short course of training.

Mr. Simmons thereupon agreed to the general principle of having a short course but he would not like to make it a condition of promotion to gazetted rank.

Mr. Howard.—wanted to clear up a possible misunderstanding that there was any proposal of a compulsory short course. Mr. Mobbs' proposal was merely permissive. If there was a good man and if the province wished to send the man to Dehra Dun, then the College legislated to accept him.

Mr. Nicholson raised the question of filling up a post which might fall vacant during the period of the lag between the Ranger being sent to the College and returning after the course of training. He envisaged the selection for filling the post could be made only by the public service commission.

Mr. Sahharwal generally agreed with what Mr. Mobbs said that they should have two courses at present and further that some arrangement might be made for allowing ranger students who pass out with outstanding merit to take the higher course with a view to appointment to gazetted posts. He also referred

to the practice in Bihar of promoting Rangers of outstanding ability to gazetted rank. He also agreed with Mr. Harlow that after some time it might be possible when conditions are favourable to combine the two courses.

Mr. Atkinson speaking for Burma said that Burma was not greatly concerned with Rangers' training at Delua Dun and that his opinion was therefore only academic. He deprecated any tendency towards a lowering of the standard of qualifications for the gazetted service. If Ranger College students were to go forward to the Indian Forest College, he was of the opinion that the standard of the Indian Forest College, would be reduced to the present standard of the Ranger College and the service as a whole would gradually be a Class II Service instead of being Class I service. He made it clear that his point was merely of academic interest as he was not concerned.

Mr. Davis was against the proposal of combining the courses on the ground that the social status of a gazetted officer was very different from the social status of a Ranger. He did not rule out exceptional cases of promotion from Rangers to gazetted rank, but he was against allowing the practice to become a matter of course, as Provincial governments might not like this.

Mr. Harlow dissented from the view taken by Mr. Davis regarding Social status inasmuch as officers of gazetted rank and Rangers in most cases came from similar families, the same university with the same standard of education.

Mr. Davis conceded that there might not be any social distinction in practice, but he made it clear that the fact remained that there ought to be some difference in status for purposes of discipline.

Chairman.—“I have heard the opinions expressed by the members of the Board with very great interest. What I had thought was that training preceded appointment. If my suggestion is followed, then a candidate would have to take his training first and then appear before the Public Service Commission for selection.”

“Two other questions which I would like to clear are these:—

The first question is that for a proper preparation for forestry a student should spend two years in an Arts College and take his degree instead of spending two years in the Forest School and get a good grounding before entering the Forest College.

The second question is whether the grounding in the Forest College would be a better preparation for entering the Superior Service or the two years spent in an Arts College.

The question relating to communal representation and the Public Service Commission depends on the course that the provinces follow in selecting their officers. For my part I think the best course is to select officers when they are qualified rather than candidates who have yet to be trained. It is agreed that selected candidates from the Rangers Class may go on to the examination in the Superior Service College. I think that to a certain extent this would meet my views because there will be some opening for men who have had their grounding in the Rangers School to qualify for the Superior Service.

I entirely agree that there should be a distinction between the Superior Service and the subordinate service, till social conditions and educational standards are levelled up. At present there is a difference and it is not possible to ignore it. For instance boys from the Doon School and other public schools are socially and educationally better qualified to be officers than boys from ordinary schools.

These are the things which deserve your consideration and it is well to prepare and plan from now for post-war developments.”

Mr. Mobbs then explained his proposal as adumbrated in his paper on Forest Education. He said.—

“The first point I wish to raise is the question of the revised rules. The original rules were sanctioned at a meeting in 1937 in Delhi when it was decided to open the College, and as Mr. Howard has said, we have had to break several of the rules because a committee sitting in Delhi could not completely visualise all the possible conditions.”

"I do not think it is necessary for the Board to occupy itself with the details of the rules. Only the major changes need be considered. These major changes are first of all in the qualifications for entry to the College. I propose to widen the qualifications. The old qualifications insisted on an Honours Degree in certain limited subjects, chemistry, botany, and zoology, I propose to admit a 2nd class Honours degree in any natural science or in mathematics or in agriculture. We realise that certain Universities do not give Honours degree and for these Universities it is difficult to lay down a rule which will not admit anyone with a pass degree to the College, although certain degrees would be acceptable. The revised rule has therefore been worded so that an Honours degree or its equivalent might be accepted."

Hon'ble Pir Illahi Bakhsh Nawaz Ali suggested that in the case of those Universities who do not confer Honours degrees it might be desirable to state in the rules a pass degree with 1st Class or 2nd Class, instead of merely stating "An Honours degree or its acceptable equivalent".

Mr. Harlow also pointed out that most Universities do not give an Honours degree in agriculture. In that case he suggested that they might treat 1st Class B.Sc. in agriculture as equivalent to an Honours degree. Mr. Mobbs explained that this had actually been provided in the revised rules.

Mr. Mobbs proceeding to explain his proposal said:—

"The next question is that of the combination of botany and mathematics. This has been stressed by Presidents at each of the two Convocations of the College, but enquiries from the Inter-University Board elicited the fact that it is impossible in many Universities for students to combine botany and mathematics. So all I have done is to put in the revised rules that a combination of botany and mathematics is desirable".

"The second proposal is the raising of the maximum age limit. At present the maximum age limit is 22 years and 11 months. A man may not have attained 23 years when he enters the College. We have had to grant many exceptions to this. So I propose to raise the age limit by one year so that a man may not have attained 24 years when he enters the College."

THE PROPOSAL REGARDING THE EDUCATIONAL QUALIFICATIONS AND THE RAISING OF THE AGE LIMIT WERE ACCEPTED BY THE BOARD.

Mr. Mobbs continuing said:

"The next point to be considered is the question of preliminary practical training. In the Ranger College a preliminary period of practical training in the forest is compulsory. It is for consideration whether it should be made compulsory for this college too. I propose that it should not be made compulsory because, as I have stated in my note, it may prevent many students obtaining the M.Sc. degree after their selection for this College."

"If we enforce a preliminary period of practical training those students would not be able to sit for their M.Sc. degree. Therefore in my revised rules I have explicitly said that a preliminary period of practical training not less than 8 months is desirable but is not compulsory."

Mr. Saharwal.—"Once or twice it had happened that after we had selected our students and sent them for preliminary training some of them after seeing the hard conditions under which they had to work and malarious climate, etc., ran away. If we did not have the preliminary training then those very students would have come here to be trained and gone back. They could not have remained long in their posts and all the time and money spent on their training would have been lost. I think it is very necessary therefore for every student to have a preliminary training for 2 or 3 months before he is deputed to Dohra Dun."

Mr. Howard.—"You can enforce it for your own students. It need not necessarily be made compulsory for the College."

Mr. Ranganathan hinted at the anomaly that would arise by the omission of the compulsory period of training in that the Rangers Course would be actually longer than the Superior Course.

AFTER SOME DISCUSSION THE PROPOSAL THAT THE PRELIMINARY PERIOD SHOULD BE RECOMMENDED BUT SHOULD NOT BE MADE COMPULSORY WAS ACCEPTED BY THE BOARD.

Mr. Mobbs continuing his explanation of his proposal went on to say:—

"The next point is the course of studies. The previous rules laid down exactly how many hours were to be spent on each particular subject. We have changed the subjects considerably. We have eliminated much that we considered unnecessary. For instance, formerly inorganic chemistry, organic chemistry and physics (heat, light, sound, magnetism and electricity) were studied. We considered that this was not necessary in the course when our students already had Honours Science degrees."

I have eliminated these from the rules. I have also omitted the former prescription of the number of hours to be spent on each subject. We could never have followed this rule, as the time spent on practical training does not leave as many hours for lectures as the old rules stipulated. Therefore the proposal I have to make is that the question of the subjects, the course of studies and the allotment of hours to be left to the President and the Principal to decide."

THE PROPOSAL WAS ACCEPTED BY THE BOARD.

Mr. Mobbs continued:—

"The next important thing is the question of the official recognition of the College Diploma. The Hon'ble Member made a suggestion that we might be affiliated to a University. There are several objections to affiliation to a university, especially as regards control, and also if our students already have science degrees and we continue the course as at present it does not seem necessary to be affiliated to a University. In nearly all cases where a post graduate course is taken this post graduate course is recognised officially, for instance the diplomas granted by the Indian School of Mines, the Imperial Institute of Sugar Technology, the Imperial Agricultural Institute, the Harcourt Butler Technological Institute. The qualification for entry to these Institutes is like ours—an Honours degree, and their courses are likewise two years. Their Diplomas are recognised officially by Associateships. I therefore propose that this Board recommend to the Government of India the proposal contained in paragraph 21 of my note namely that students who take the diploma of this college be entitled to call themselves Associates of the Indian Forest College, with the right to add the letters 'A. I. F. C.' after their names, following their University degrees."

THE PROPOSAL WAS AGREED TO BY THE BOARD.

Mr. Mobbs then took up the proposal in paragraph 22 of his note regarding the grant of a Fellowship of the Institute as a corollary to the grant of the Associateship (A. I. F. C.) to holders of the diploma of the College. He said:—

"For the Fellowship I suggest that a man should have done 3 years' continuous research or five years' research in a research post in a Province, or such other extensive research as may be acceptable, and also he must have published a thesis. The main point is whether there should be such a thing as the grant of a Fellowship of the College (F. I. F. C.) at all. I, for myself would like to institute such a Fellowship which would mean the recognition by a recognised body that a man had attained a certain distinction in forestry."

THE BOARD CONFIRMED ITS AGREEMENT TO THE GRANT OF THE ASSOCIATESHIP (A. I. F. C.) AND THAT THE GOVERNMENT OF INDIA SHOULD BE APPROACHED IN THE MATTER BUT IT DECIDED THAT NO DECISION ABOUT A FELLOWSHIP COULD BE REACHED AT PRESENT.

Mr. Mobbs continuing

"The last thing, gentlemen, is the provision of special short courses for people who are to be promoted. The question is whether such courses are desired or not. If a Ranger of 20 years' service or so is to be promoted to gazetted rank without being sent to a regular course of the Indian Forest College, is it desirable that there should be special short courses for him? He

might, for instance, require some special training in Working Plans which previously he did not have. I raise this point because it has been raised to me by provinces—whether we could give some sort of special training for Rangers who were to be promoted to gazetted rank. To come to a decision on this point we want to know first whether provinces actually want this course, and, if so, how many people they are likely to send and whether such a course would be worth instituting."

Mr. Howard said that he had also been approached about this same proposal but he was rather sceptical of the scheme since it would involve the appointment of additional staff. If there was not a sufficient demand from provinces the proposal might be dropped.

Mr. Harlow was not in favour of any short course as he considered it a waste of time for a Ranger after a certain age to take up academic learning afresh.

Mr. Sothers strongly supported Mr. Harlow as he considered the refresher course would be sufficient.

IT WAS AGREED BY THE BOARD THAT THERE WAS NEITHER A DEMAND NOR A DESIRE ON THE PART OF PROVINCES TO HAVE A SHORT COURSE AS PROPOSED BY MR. MOBBS IN ITEM (IV) OF PARAGRAPH 22 OF HIS PAPER.

Before proceeding with the remaining items in the agenda, Mr. Howard suggested that the Board might review and finally approve its recommendations on items Nos. 1, 3, 4, 5, 6, 7, 8, 13 and the new items under No. 9, namely, the provision of a sinking fund for post-war forest expenditure and the annual conference of senior forest officers.

The recommendations so far arrived at and as drafted previously were read out to the Board for the information of such of the members as were not present on the preceding days.

Item No. 8 relating to the resolution of the Silvicultural Conference on erosion control revived a lively discussion from members who were not present on the previous days.

Mr. Simmons put the problem to the Board as affecting the conditions prevailing in Assam namely Shifting Cultivation. In his opinion the problem was not one of grazing control at all: it was largely a problem of land policy as distinct from forest policy. He suggested the appointment of a Standing Body in each province composed of representatives of the Forest, Irrigation, Agriculture and Revenue Departments and possibly a Railway Officer. His experience was that his department in Assam had been impressing for years upon the Provincial Government the importance and the seriousness of the problem of erosion and its control, but a definite statement on land policy was essential.

Mr. Atkinson informed the Board that they were intending to proceed in Burma on exactly the same lines as suggested by Mr. Simmons, namely, that erosion was to be a matter of general land policy rather than for the forest department alone.

Sir Harold Glover put forward the suggestion that the subject of general land management should form part of the syllabus prescribed for the examinations to be passed by the I.C.S. Officers in the same way as the land revenue manual is prescribed for examination.

Mr. Simmons wanted some definite policy to be laid down on an all-India basis. Unless such a policy was laid down, Provincial Governments would not be likely to take action to prevent erosion.

Sir Harold Glover suggested that the problem was not so much one of legislating for the whole of India as one of getting into the villages. One of the best methods of teaching the villages in his experience in the Punjab was by propaganda. Sir Harold narrated for the information of the Board the methods of propaganda in this direction adopted by the Punjab.

After discussion it was decided that the points raised by Mr. Simmons should be brought into the recommendation as drafted on the previous day. The recommendation given on pages 54-55 ante embodies the final opinion of the Board.

The Board then resumed discussion of item No. 11, which was left over for completion from the previous day.

Sir Harold Glover wished to bring forward a point in regard to the training of the superior class officers as distinct from the Rangers. He maintained that a wider education was needed for officers. One of the means of imparting this wider education was, he suggested, that the superior officers classes should be given lectures by officers who visited Dehra Dun, not only forest officers, but by scientists and officers of other departments in the same way as was being done in the case of the I.C.S. probationers.

Mr. Howard welcomed the suggestion of Sir Harold Glover. He pointed out that there was no difficulty in obtaining lecturers from Dehra Dun or from a place near at hand, but that the real difficulty lay in the fact that the budget of the Institute could not very well afford to meet the expenses if Sir Harold Glover meant that lecturers should be brought to Dehra Dun from all parts of India. Mr. Howard put it for the consideration of the Board that, if provinces would agree to send important officers to deliver lectures at the Dehra Dun College at their expense, it would be most welcome.

ON THIS QUESTION RAISED BY MR. HOWARD, IT WAS AGREED BY THE BOARD THAT, WHETHER THE PROVINCES WOULD PAY THE EXPENSES, OR NOT, THE SUGGESTION WAS EXTREMELY DESIRABLE.

The Board then took up the Ranger Training Course at Dehra Dun.

Mr. Ranganathan in explaining the main points in his paper made it clear at the outset that what was required was the Board's advice and not its decision, because there was a difference between the Ranger College and the Indian Forest College so far as the Board was concerned. The Board was directly associated with the control of the Indian Forest College but not with that of the Ranger College. He invited the views of the Board, which would receive the utmost consideration.

Proceeding, Mr. Ranganathan said:—

"I turn to the question of the qualifications. We raised the qualifications for admission to the college from matriculation or its equivalent to intermediate in science or its equivalent last year and the students who were admitted this year were recruited on that basis. There were several reasons which induced us to take this step. The first reason was that we were able to get highly qualified men, in fact most of them university graduates to take up this course. Before we raised this qualification to intermediate in science, the position was that a very small percentage of the students actually admitted from year to year were matriculates. The great majority of the students recruited were, in fact, university graduates and some of them were intermediates in science. For instance in the class recruited in April of last year under the old qualifications rule out of 34 students there were 23 university graduates, and only one matriculate, the rest being either intermediates in arts or intermediates in science. That is one reason why we were induced to raise the initial qualification for admission.

The second, and a very much more important, reason was this. We found that we simply did not have time to teach matriculates elementary science. Many matriculates did not possess an adequate knowledge of elementary science and they did not know, for instance, what was meant by specific gravity. The result was that we had to waste valuable time to explain to them what all these meant. Another difficulty was the lack of a sufficiently strong grounding in the English language. Matriculates were not able to follow the course, or, if they did follow it, were unable to answer examination papers in English. The consequence of all this was that, as we admitted matriculates under the old regulations, the course had to be slowed down, and consequently the standard of teaching was lowered. Therefore we thought a simple solution of this problem would be to raise the initial qualification to intermediate in science or its equivalent.

The third reason which actuated me in suggesting this was that I felt we ought to make a deliberate effort to equate our Ranger Training to a degree course at the University. It is, in fact, in all but name a degree course. We take in men who are, as I have explained, most of them graduates or most

of them intermediates in science. We give them two years' training in the Forest Institute, and that is the usual period of teaching in university classes. So this Ranger Course is in all but name equivalent to a degree course in an Indian University. That being so, I thought that, in order to make our course correspond to a university course entirely, it was a reasonable thing to raise the initial qualification to Intermediate in Science. I may say that we have had no serious difficulty in this matter except in the case of one or two States which have found some difficulty in getting candidates of the required qualifications and to meet this we have provided in the rules for special exemptions to be granted by the President to cover such special cases. That is all I have to say on the subject of qualifications."

Mr. Simmons was in agreement with the raising of the standard of qualification to Intermediate on the grounds that Matriculates have to be taught elementary science and mathematics. He did not like the idea of admitting graduates to the Ranger College because that would be making the qualifications for admission to the Ranger College too close to the qualifications required for admission to the Indian Forest College. He for himself would prefer to keep the Ranger Course and the Indian Forest College Course entirely separate. His fear was that the raising of the standard of the qualifications of the Ranger Course might lead to the importing of too much theoretical training to Rangers thus leading to demands for accelerated promotion to the P. F. S. from among the Delma Dun trained Rangers. He reiterated that there must be a marked distinction between the Subordinate service and the Gazetted service and therefore he did not like the idea of forcing up the educational qualifications and the subjects in which the Subordinate services were to be trained to anything near what they had for the Gazetted service. In other words, the Rangers Course should be essentially practical.

At this point Mr. Howard intervened to warn the members to confine themselves to the exact point at issue which was whether it was agreed or not to raise the standard of admission to the Ranger Course.

Mr. Simmons intended to convey that there should not be the possibility that simply because a Subordinate happens to possess a degree he should be given preferential consideration for promotion to gazetted rank. Promotion from subordinate to gazetted rank should be purely on merit. He disliked the idea of encouraging Rangers to be taught anything outside a practical syllabus that is the Ranger should not be taught the theory of forest management or the theory of the preparation of yield tables or Working Plans. What the Ranger had really got to do was to know how to use a volume table or a working plan. He visualised administrative difficulty if the proposal to raise the Ranger qualification and training to the level of the Indian Forest College was carried out.

Sir Harold Glaser reminded the Board of the probable necessity of a relaxation rather than the raising of the qualifications when the time came for providing ex-soldiers with appointments in the Forest Department at the end of the war.

Mr. Hall although he agreed entirely with what Mr. Simmons had said, pointed out the practical difficulty of refusing admission to the Ranger Course to candidates with higher qualifications if they offered themselves.

Mr. Harlaw discounted the view expressed by Mr. Simmons on the ground that the line of demarcation between the Gazetted officer and the subordinate had been imposed by circumstances and by the fact that they had originally a review of gazetted officers namely British. The line of demarcation that they had drawn was, in his opinion, entirely wrong. The right point to draw that line was probably at the bottom of the Ranger grade. The Rangers were definitely the same type of men as they got in the provincial services. Both classes came from the same universities with the same degree of culture.

Mr. Dyson pointed out that at a recent selection of candidates in Madras it had been necessary to accept some candidates without Intermediate qualifications, owing to the general unsuitability of many applicants with Intermediate

or degree qualifications. It was therefore necessary for the President to continue to exercise his right to waive the Intermediate qualification, not only in the case of war-returned men.

After a discussion which centred round the qualifying examinations held by provincial governments and at Dehra Dun the ideas were FINALLY summarised as follows:

IT WAS AGREED THAT IT WAS CORRECT TO RAISE THE STANDARD TO INTERMEDIATE. THE PRESIDENT SHOULD RESERVE THE RIGHT TO WAIVE THIS AND USE IT RATHER FREELY IN THE CASE OF WAR-RETURNED MEN.

Mr. Ranganathan took up the point made about the distinction between the two classes. His point was that both courses, as at present constituted, were of equal duration. Both had a course of 2 years and in practice, as he had already explained many of the men they got at the Ranger College were graduates in Science, although the Indian Forest College insisted that their men should all be graduates in science, so that in practice there was not a great deal of difference between the two. He conceded that the Indian Forest College syllabus included additional subjects and dealt with more theory than that of the Ranger College. He also agreed that there must be a difference between training officers and training rangers and it was on "how to bring about this difference" that he invited the Board to express an opinion. One obvious way of doing so was, of course, to lengthen the officers' course by, say, six months. Actually there was the anomaly that in several cases the Ranger course, taking into account the preliminary period of practical training, was longer than the officers' course. This anomalous situation required to be remedied and with this Mr. Mobbs was more concerned than the speaker himself. Mr. Ranganathan recommended the suggestion of making the officers' course longer than the rangers course by six months. He was not oblivious to the converse solution of reducing the length of the Ranger course. From his experience, he thought they would not have the necessary time to go through the Rangers course if the present period was reduced. To sum up Mr. Ranganathan's contention was that, while he agreed that there should be a distinction between the two courses, he was in favour of maintaining the present standard of admission to the Ranger course.

Mr. Howard thought it was a very great mistake to teach the Ranger much of the theory of forest management and things of that sort, which obviously concerned the Gazetted officer. He for himself would like the Ranger course to be a really practical course devoted for example not so much to the preparation of working plans and yield tables as to how to use those plans and table.

Mr. Mobbs took up the suggestion made by Mr. Ranganathan for lengthening the officers course. He said:—

"Nobody would be more pleased than I if my course could be increased in length. If we could devote 3 years to it instead of 2 years, we should certainly have time for general reading, which at present my students find extremely difficult to find. They do not get as much time for the general reading of forest literature as I believe an officer ought to have.

But you have to realise the question of cost. So long as we have the present cost I think no province is going to pay for a 3 years' course. If you can persuade the Government of India to endow my College so that we can reduce fees, and have a 3 years' course with no increase in total cost, nobody would be more pleased than I. That is my first point. My second point concerns the question of the actual training. I have had the opportunity of being in charge in 1930 of the Ranger College and of being in charge of the Indian Forest College for over 4 years and I can say from my experience that there has been in my own conduct of the training a very considerable difference between the standard of the teaching to the Rangers and the standard adopted for my present students. My own impression is that if the teaching in the Ranger College and the teaching in the Indian Forest College are the same, then you will be teaching too much to the Rangers. I agree with Mr. Simmons that a Ranger's function is to know how to use a working plan or how to use

a yield table and not necessarily how to draw up a working plan or how to construct a yield table. I would prefer 2½ years or 3 years if you can arrange for the funds to keep the cost down, but given only two years I still think that I can maintain a difference unless the Ranger Course is turned into an Officers course."

Mr. Davis was also of the same opinion as Mr. Simmons.

Sir Harold Glover expressed surprise at the fact that this was the first time that they have had the opinion of the senior Instructor in charge of the Officers class that the course was too short and he was trying to crowd far too much into those two years. He (the speaker) deplored the fact that Mr. Mobbs had assumed that the provincial governments would not pay for the cost of a normal education. Speaking generally Sir Harold Glover was optimistic that the Ministers themselves would insist on getting education in forest matters which would be on par with that of any University in the world.

Mr. Simmons was not very hopeful on this point about Assam.

Hon'ble Pir Illahi Baksh Nairaz Ali.—"I agree with Mr. Mobbs that the question of cost is most important and I think my Government will not be able to pay any more. After I have gone through the list of expenses for a student I am inclined to think that with the same cost we shall be able to send our boys to America or even to the Continent which will get them the same diplomas or degrees within the same period. Therefore if you want to raise the cost very few Governments will be able to send their candidates here. I, therefore, think that the present arrangement should continue. On the contrary, I would advise Mr. Mobbs and Mr. Ranganathan to reduce the cost of living and I will offer my remarks on this point when Mr. Ranganathan puts it to the Board."

Mr. Sahharwal.—"The point has been raised about the method of teaching in the Rangers Class. I am strongly of the opinion that the type of Rangers coming out of this College now are what we want. We do not want to reduce the length of the course nor to lower the standard of teaching. The present standard of teaching in the college seems to be necessary for turning out the Rangers we want for the efficient administration of the Department."

Mr. Harlow deprecated any attempt to reduce the standard of the curriculum of the College. He, for himself, felt that if Mr. Ranganathan found his students to be of such a standard as to allow of the teaching of forest management, it was open to Mr. Ranganathan to convince the President of the Institute of the fact. For practical purposes the teaching in the Ranger College could not now approximate to that of the Indian Forest College but he regarded it as inevitable that after a certain number of years the two courses would be amalgamated and if a higher standard was possible in the Rangers course, all the better. He agreed that the Rangers should concentrate on the practical side of their work but if they found time to study other subjects like forest management and yield tables and Mr. Ranganathan could convince the Inspector General that he can teach those subjects then he ought to be allowed to do so.

Mr. Nicholson also agreed with Mr. Simmons that there was a danger of the Ranger Course being gradually divorced from the practical side.

Mr. Harlow pursuing his point, that Rangers should also be taught the theory of forest management and so on, said, that in most provinces there were training institutes for their Foresters which provided purely practical courses. He wanted to know whether there was any need for two practical courses of different standards.

The subsequent discussion on this part of forest education revealed that there were two schools of thought namely, one advocating the retention of the difference between the two courses, and the other favouring the lessening, as far as possible, of the difference between the two courses and advocating the approximation of the Ranger course to that of the Indian Forest College provided it was not done at the expense of practice.

Eleven members belonged to the first school and 4 to the second. The Board merely wished this point to be recorded and did not make any definite recommendation.

Mr. Ranganathan, continuing to explain his proposals, said:—

"The next point in my proposals is in regard to touring. At the risk of repeating what I have stated in my note, I may say that till about 1938 this college was a regional training centre, that is to say, it trained men for the northern provinces mainly U. P. and Punjab, Bengal and Assam. In 1938 with the closing of the Madras Forest College, men who used to go to that college for training, for instance, from the C. P., Bihar, Orissa, Sind and so on, have started coming to this College. Therefore from that date this institution became an all-India training centre. The instruction which was primarily based on the silviculture of *sal* and *deodar* was no longer adequate for men who would never see a *sal* tree after they left this place and whose main work would be in mixed teak forests or in sandalwood forests. This point of view was appreciated by Mr. Mason, the then President of the Institute, and he proposed to meet it by widening the scope of the touring of the Rangers and therefore suggested that the Rangers ought to go to the C. P. and as far as Madras and Bombay. We also took our students once to Bihar. The principle of this training then was that the training here had an ecological basis, that is to say, men here should understand how to correlate silvicultural systems and their actual work in the forest with the local conditions both of climate and soil. Once they are taught that, it is believed that any Ranger trained here could work in any province. It is not pretended that the training is completed here, but it is believed that they are put in the way of learning the local methods within a very short time if they have a grounding such as I have described. Boiled down to actual practice, it means that the Ranger student, instead of touring in the U. P. as he originally did and later in the U. P. and the Punjab, will tour in certain other typical provinces to see at first hand the growing of the various species.

Mr. Davis was entirely opposed to the introduction of widespread touring for the Rangers. In the past for many years after the Rangers College was first started (when it trained rangers not only for the whole of India but for Burma as well) they obtained excellent rangers who had done their touring in the U. P. alone. In his opinion it would be a waste of time to teach a ranger ecological conditions in a large number of different types in different provinces. If, on the other hand, the training was confined to one or two provinces, there would be more time for practical work, which was so important.

Mr. Sothers would prefer the rangers to spend their time on a concentrated study at Dehra Dun and in those forests reasonably near to it rather than on extensive touring. Obviously such touring would take up a good deal of their time and leave less time for practical work.

Mr. Atkinson informed the Board that the Ranger students from Dehra at one time made some of their best gazetted officers in Burma, although they merely had the advantage of training in the local U. P. forests.

Mr. Ranganathan wanted to clear the impression that much time had been taken up by widespread touring. The extra time spent in such touring was relatively small, not more than 10 days in two years. The cost also was negligible. Formerly the touring used to cost Rs. 400 for two years; it has now gone up to Rs. 600 owing to the increase in the cost of transport caused by the war.

Mr. Simmons was of the opinion that the question of touring had also some bearing on the question of the distinction between the status of rangers and that of gazetted officers. He said that the touring of Ranger school should be very much less than the touring of the Officers College.

The discussion was finally summarised as follows:—

THE OPINION OF THE BOARD IS THAT THEY APPROVE OF THE APPROXIMATE PRESENT SCOPE OF RANGERS' TOURING, WHICH IS THE PUNJAB, THE U. P. AND THE C. P.

THE BOARD ALSO NOTES THAT MR. RANGASWAMI CONSIDERS THAT RANGERS' TOURING SHOULD BE EXTENDED TO THE SOUTH OF INDIA.

The Board then discussed the question of allowing the students who pass out of the college to write the letters "F. R. C." after their names, the letters standing for "Fellow of the Rangers College".

Mr. Harlow agreed to the general principle that students of the College when they pass should be allowed to write some letters after their names, but would prefer to leave the actual method of devising the letters to the President.

Mr. Simmons was entirely opposed to the proposal because it would lead to many difficulties.

Mr. Gotley suggested "F. R." (Forest Ranger) in place of the high-sounding "F. R. C." which might be mistaken for the fellowship of some other institution.

Mr. Sabharwal was also agreed upon the main principle of writing some letters after their names by the students.

Mr. Nicholson considered it undesirable since it was rather apeing the superior course title.

The discussion among the members indicated that there were three distinct groups among them, namely (a) ten members considered the proposal was undesirable, (b) four members wanted the discussion of the proposal to be postponed, and (c) two members were of the opinion that it was desirable and should be done in the same way as it was to be done in the case of the superior course.

ARRANGEMENTS FOR RANGER STUDENTS TO TAKE THE SUPERIOR FOREST COLLEGE COURSE.

Mr. Ranganathan did not want to add to the discussion of the previous day on the arrangements for ranger students to take the Indian Forest College Course.

Continuing Mr. Ranganathan proposed that the stipend granted to the Ranger students be increased by 50 per cent. The present stipend was Rs. 50 for a Ranger student and Rs. 100 for an Indian Forest College Service student. There had been a steep increase in the cost of living; statistics compiled at the Forest Research Institute of the cost of living showed that it had increased by more than 100 per cent in all respects. The present stipend was no longer adequate. In support of his argument Mr. Ranganathan read out to the Board the various reasons for the increase in the cost of living especially at Dehra Dun.

Mr. Simmons said that no one could commit his Government to any increase in expenditure and that the Board could merely take note of the suggestion. He also considered that it would be useful for the members to be provided with the cost of living index in Dehra Dun so that they could take the matter up with their individual Governments.

Mr. Howard promised that he would send a copy of the indices unofficially to anyone who wanted it.

Mr. Harlow drew attention to the very great disparity between the stipends granted by various provinces and invited the Board to recommend that stipends be brought to a uniform level.

Mr. Howard informed Mr. Harlow that the question of the disparity in stipends was already engaging the attention of the President of the Institute but he thought that the question of levelling out the disparity was a much wider issue than the Board had time to deal with at present.

Mr. Hall suggested a way out of the difficulty by the grant of increased stipends to be recovered from the pay of the rangers afterwards.

Mr. Sothers stated that the position of his students with regard to stipend was causing him anxiety. He wished the Board to pass a resolution to the effect that it recognised that there was a risk of unstipended or partly stipended students leaving the College in debt, that the dangers likely to be caused by such a situation were so serious that the risk must be avoided and that this could best be done by asking that all Provinces should provide their students with a stipend on as generous a scale as the province could afford.

Mr. Ranganathan welcomed Mr. Sothers' suggestion as having the additional advantage of enlarging the field of recruitment of the best type of student.

The Hon'ble Pir Illahi Bakhsh Nawaz Ali, while agreeing with Mr. Sothers that provinces should grant stipends on as generous a scale as possible, spoke critically of the apparent extravagance of the life that the Ranger students were leading at Dehra Dun. He drew upon his own experience of many college hostels and University boarding houses in various big cities and was emphatically of the opinion that compared with the rates for messing charges for students at other centres, the charges at the Ranger College were disproportionately heavy. His conception of a Ranger student's life was that he should be accustomed during his college course to the same kind of hard life which the student would meet when he went out of the college into the jungle as a forest ranger. In his opinion if the ranger students were permitted to lead an extravagant life now they could not easily bring themselves to the level of a forest ranger's life when they entered actual service; and naturally in order to keep up their present extravagant standard they would be tempted to succumb to such practices as bribery and corruption because one could not expect a forest ranger starting at Rs. 50 or 60 to maintain himself at the level at which he maintained himself as a student at this Ranger college.

In all the circumstances the Hon'ble Minister would rather decrease the present stipends than increase them. He suggested for example the elimination of unnecessary expenditure such as was at present being incurred on extra bearers, barbers and so on. In short, the cost of living of a Ranger at Dehra Dun should be cut down so as to bring it to the level of middle class people.

Mr. Ranganathan quoted facts and figures to dispel the apparent misunderstanding or rather misconceptions surrounding the life of the Ranger students at Dehra Dun. He was definitely of the opinion that they could not possibly reduce the present rate of Rs. 45 per student monthly as messing charges without producing an adverse effect on the health and efficiency of the students. Quite apart from the mental training, physical training of the student was also equally important.

Mr. Sahharwal disagreed with what was said by the Hon'ble Minister from Sind regarding the high charges of messing. He was not in favour of reducing the charges which would mean the reducing of the quality as well as the quantity of food.

Mr. Rangaswami was also not in favour of reducing the stipend or reducing the messing charges. He referred to the possibility hinted at by the Hon'ble Minister from Sind of Rangers becoming corrupt after having led the allegedly extravagant life at Dehra Dun and did not consider that the Rangers would become corrupt.

THE BOARD NOTED THE REMARKS MADE BY THE VARIOUS SPEAKERS ON THIS MATTER.

The Board then considered the question of the increased cost of touring.

The general opinion of the Members of the Board was that there was very little chance of getting more money from Provincial Governments for touring.

There was general agreement that there could be direct correspondence between the College and the local D. F. Os.

The Board finally recorded its opinion as follows:—

THE INDIAN FOREST COLLEGE.

1. *The Revised Rules.*—The Board considered the Revised Rules. It agreed that minor details should be left to the President and the Principal, and proceeded to vote separately on the major changes. These were:—

(i) *Educational Qualifications for admission to the College.*—The revised rules widening the qualifications were approved, but with the words "natural science" instead of simply "science".

(ii) *Admission of Rangers.*—The new rules providing for admission of Rangers under 30 years of age were approved.

(iii) *Age limits.*—The raising of the age limit by one year from 22 to 23 was approved.

(iv) *Preliminary practical training.*—The new rule stating that preliminary practical training for a minimum period of three months is recommended, but that such training is not made compulsory, was approved.

(v) *The Course of studies.*—The Board approved the changes made in the course of studies, and agreed that the detailed regulation of the course and the allotment of time to the various subjects should be left to the President and the Principal.

(vi) *Official recognition of the College Diploma.*—The Board approved of the proposal that holders of the Diploma of the College should be styled "Associates of the Indian Forests College", with the right to use the letters A. I. F. C. after their names, following the letter indicating their university degrees, and agreed to recommend this to the Government of India for official sanction.

(vii) *Fellowship of the Indian Forest College.*—The Board discussed the proposal to institute the Fellowship of the Indian Forest College as a Research Degree. Decision was postponed for the time being, as the need for such a degree would not arise for some years. It was agreed that the matter should be omitted from the rules for the time being.

2. *Provision of special short courses.*—The Board discussed the need for special short educational courses (as distinct from research demonstration courses) of a few months duration for Rangers over 30 years of age about to be promoted to Superior Service, and for Class II officers about to be promoted to Class I service, as "refresher" courses. While certain provinces considered that such courses might be desirable, none could give any guarantee that they could send men to such courses, and in view of the expense that would be involved by the increase of staff that would be required for such courses, it was decided that no action should be taken for the time being.

3. It was agreed that if officers outside the Institute could give an occasional lecture to the students on special subjects this was most desirable.

4. *Indian Forest Rangers' College.*—The Board agreed that it was correct to raise the admission standard to Intermediate. The President, Forest Research Institute has the power to waive this educational qualification and he should exercise the power freely for war service men when they return.

5. There was some difference of opinion about the type of instruction to be aimed at in the Ranger's course. The Director, Indian Forest Ranger College pointed out that the educational qualification of the Ranger student was not much inferior to that of the Superior class student and that the Ranger student also received a two years course in the same way as the Superior class student. He considered that Rangers training tended to approach that of the Superior class. There was some difference of opinion whether this was altogether desirable. Nine of the delegates were of opinion that it was essential to keep the two types of training different and that the training of Rangers throughout must have a direct practical bias, four of the delegates, however, considered that the less difference there was between the training of the two classes the better, provided this was not at the expense of practice.

6. The Board agreed that approximately the present scope of touring for Rangers was correct, namely, the Punjab, the United Provinces and the Central Provinces. Mr. Rangaswami from Coorg dissented from this view and said that the Rangers' touring should be extended to South India.

7. There was a difference of opinion whether the successful completion of the Ranger's course should be recognised by the award of definite letters to be used after the name. Two delegates were in favour of this four considered that a better decision could be made after some experience with the proposed Associateship for the Superior class and ten delegates were opposed to granting such letters.

8. The Board noted the remarks made by the Principal, Indian Forest College, and the Director, Indian Forest Ranger College, about the rise in the cost of living and the inadequacy of the stipend.

ITEM No. 12.—NOTE ON A CO-ORDINATED STUDY OF BAMBOOS.

By J. C. M. Gardner, Esq., I.F.S., Forest Entomologist, Forest Research Institute.

Interest in bamboos has been very greatly stimulated by enormous demands for war purposes and recent investigations at the Forest Research Institute, particularly in connexion with the prevention of insect attack on felled culms, have shewn that there are serious gaps in our knowledge of bamboos.

It is true that much miscellaneous published information is available but it is scattered, often in rare or obscure journals, requires collation and in many cases checking up.

Is co-ordinated research in the bamboos of India desirable and economically justifiable? If so it is suggested that a "Manual" or series of correlated "Forest Records" might be aimed at in which all information would be summarised and made easily accessible. Such a project would be a long term one, since some of the necessary investigations, especially those connected with the living plants, would be covered only after several years. There is no need for haste and any "emergency" demands for information could be met by issuing "Forest Leaflets".

The investigations could not be covered by the F. R. I. alone and active collaboration with forest officers in the provinces would be essential.

Research could be organized under some such headings as given below; the arrangement is somewhat arbitrary and is not intended to suggest "water-tight compartments" of research for branches, in most cases the problems are so interconnected that active collaboration would be essential. The classification is not meant to be entirely comprehensive.

BOTANY.

1. *Systematics*.—This subject appears to have been adequately covered so far as external characters are concerned and little or no further work may be necessary. Technical botanical descriptions need not be reprinted, but a synopsis, perhaps in the form of a "key" might be issued for the guidance of forest officers. Further work is necessary to provide a means of identifying manufactured culms, that is, culms with most of the more obvious external characters removed. This has been a "war demand" but difficulties in producing a comprehensive key are due to considerable variation within a species.

2. The Anatomy of the bamboo does not seem to have been studied in detail of importance for physiology, chemical control of insects and probably for identification.

3. *Ecology*.—Soil, light, water, etc., requirements, the effect of these factors on growth. The special demands of the various species.

4. *Physiology*.—The method of growth, the formation and distribution of carbohydrates (starch, sugars) in the various parts of the plants, in different times of the year for all parts of India where bamboos grow. (This is not of purely academic importance: insect attack on felled culms is related to carbohydrate content which varies seasonally, when starch is low, insect attack is least).

SILVICULTURE.

Propagation. Management generally. Use as under-storey.

Elimination of bamboos where undesirable. Causes of overcrowding.

Provision for supply of desirable species.

Possible introduction of exotics etc., etc.

(Mr. Griffith suggests that each species should be written up on the lines of Deogun, 1937, Indian For. Rec. 2 (4) for *Dendrocalamus strictus*).

UTILISATION.

Physical and mechanical properties of various species with investigation where required. (Strength properties; relation of culm dimensions to strength; mature and immature culms; dead culms, etc.)

Seasoning: air, kiln, water soaking; shrinkage and expansion under various conditions.

Paper pulp production.

Possibility of new uses. Forecasting demands for various purposes.

PROTECTION.

(a) *Mycology*.—A brief summary of fungi of minor importance, or if any are of consequence, more detail. Treatment.

(Perhaps bacteria and virus diseases).

(b) *Entomology*.—(1) *Insects attacking living bamboos*.—Beeson (1941) has suggested control measures for the more important (*Estigmene*, *Cyrtotrachelus*) but further information on efficacy of control and on valuation of damage may be necessary.

(2) *Insects attacking felled culms*.—Chiefly concerned are Bostrychidae, *Binoderus* spp. in particular. The control of the "ghoon" has been under study at the F. R. I. as a war project. It is probable that incidence of attack has been increased by out-of season felling (when starch is supposed to be highest, with consequent increased susceptibility) but a great deal more work has to be done on the variation of starch with season in various parts of India before "safe" felling periods can be prescribed with accuracy.

BIBLIOGRAPHY.

Preparation of a bibliography by specialist officers under heads to be arranged. I suggest that this should be annotated, that is, each entry should be accompanied by a brief note indicating the gist of the article, unless this is adequately shown by the title.

PUBLICATION.

It would obviously be preferable to aim at having information on bamboos made readily accessible by printing in concise parts (at least under major headings) rather than in scattered articles. This ideal is rather complicated by the time lag that will occur under some heads requiring prolonged study.

I rather tentatively suggest the possibility of issuing printed information, using a decimal system of arrangement, under a loose-leaf system. This may not be practicable for economic or other reasons however.

Mr. Gardner (Entomologist of the Forest Research Institute) in introducing the subject said that bamboos had become extraordinarily important owing to war demands. One of the most urgent needs was the protection of felled culms from insect attack and this as well as other aspects had been taken up intensively at the Forest Research Institute during the past year. During this period it became apparent that there were serious gaps in our knowledge of bamboos from many points of view. Mr. Gardner suggested that collaborative investigations by the Forest Research Institute and Provinces were required but the question was whether a long-term research scheme should be initiated during the present emergency period or whether investigation should be limited to a few aspects of urgent importance. Mr. Gardner mentioned as an example one case where further information was urgently required. At certain times of the year the starch-content in bamboos is low and susceptibility to insect attack is correspondingly reduced; if "safe periods" for felling for all parts of India could be defined, the insect risk would be minimised. Beeson (Forest Insects, 1941) had indicated safe periods, but these referred to one species of bamboo and more particularly to Dehra Dun. Mr. Gardner suggested that Provinces might assist by carrying out simple experiments to correlate month of felling with liability to insect attack.

In the discussion that followed it was found that several provinces could not afford to undertake experimental work immediately during war time, the difficulty being the collection of the necessary information. The question, therefore, resolved itself into whether some such scheme on a long term basis, as propounded by Mr. Gardner, was necessary, if not immediately, then at least as soon as circumstances permitted.

The discussion was summarised as follows:—

“The Board notes Mr. Gardner’s proposal to start experimental work on the safe period for bamboo fellings and approves. It appears that all provinces can co-operate in what is required for that particular portion of the investigation.

So far as the long term project of the general co-ordinated study is concerned, the Board agrees that provinces can supply a certain amount of the information which Mr. Gardner needs and will supply it but the project as a whole cannot be undertaken till after the war.”

ITEM No. 10.—WAR AND POST-WAR POLICY OF THE FOREST RESEARCH INSTITUTE.
By S. Howard, Esq., I.F.S., Inspector General of Forests to the Government of India and President, Forest Research Institute and Colleges.

This item is placed on the agenda to give members of the Board an opportunity of discussing what the Institute is doing during war time and to invite ideas of what its aim should be after the war.

WAR POLICY.

The general scope of the work of the Forest Research Institute and Colleges is given in the revised Appendix IV of the Forest Department Code, 7th Edition, issued in 1938. The Government of India has not revised this policy during war time any more than the general forest policy of the Government of India contained in Circular No. 22-F., dated October 19, 1894, has been revised. But just as provinces have modified the general forest policy to meet war time demands, so has this Institute. Various circulars and orders have been issued by the Government of India giving instructions for Government departments during war, but these cannot apply in their entirety to research work. For example, a general order is that no new expenditure is to be undertaken unless it is inevitable and remunerative. By its very nature much research work cannot be inevitable and till it is finished nobody can possibly say whether it will be remunerative. Once therefore it has been decided to continue a Research Institute during war such principles as the above can only be taken as a very general guide.

2 Summed up briefly, the general war interpretation of war instructions applied to the Institute policy has been—

(i) War research work takes preference over any other items of research or the programme;

(ii) to continue long term research when the closing down of such items would mean the loss of a considerable amount of past money and research even though these items have no direct connection with the war;

(iii) not to commence new items of long term research unless likely to affect the war;

(iv) to finish off short term research already started in so far as staff and money permits even though not directly connected with the war;

(v) to take up short term items of research even if unconnected with the war provided the existing staff, money and time permit. In practice this does not arise as the staff and money is already fully occupied on (i) to (iv) above.

3. Immediately war work began to influence the Institute work, it became apparent that it would waste its time if it attempted to become a supply unit. I give one example only. The Institute was asked to supply as many box shooks as possible and was asked to estimate the supply. It was obvious that the small plant here, designed for research and not for commercial output, could make no appreciable contribution to the war effort supplying shooks, but as a research unit it could make a contribution which could not be made by any other institution in India. The Institute has been prepared to solve any war research problem (and you will be shown how very varied, considerable and important these problems have been) but it would not supply more articles than was necessary for the solution of the problem. Once the problem was solved the individual or department concerned obtained his supplies elsewhere though

very often with the advice of the Institute. There have been exceptions. For a small quantity of a very specialised article the Institute has sometimes produced the actual supply. I am not permitted to give an example in print but you will be told of this at the Board.

4. The incidence of the classification in para. 2 in the different branches of the Institute varies considerably.

Botany Branch.—This branch could make little direct contribution to the war effort and was mostly concerned with items 2(ii) to 2(v) above or in other words practically continued its peace time programme. It makes, however, some contribution to war, for example, the mycological work has been largely expanded because on it partially depends the work of Wood Preservation whose contribution to war work has been direct and considerable. Some direct contribution has also been made, for instance, in helping to work out a key for the identification of bamboos in the converted state and the ages of the culms—a most important matter for tent poles for Ordnance.

The Silviculture Branch.—Here also by its very nature direct contributions to war work are unusual. Even so, however, the Branch has produced certain direct and valuable work. Apart from such items as the information compiled and supplied by it about rubber shortage—a most important contribution—it has helped in growing various war products. Mostly, however, its work must be connected with items 2(ii) to 2(iv) above.

The Entomology Branch.—This is largely concerned with direct war work and with item 2(ii). The Entomology branch has taken charge of a combined investigation for Ordnance of identification, protection and preservation of the very large number of bamboo tent poles needed. It is also at work continuously with advice on the protection of timber in the various Ordnance depots before shipment overseas.

The Chemistry and Minor Forest Products Branch.—The whole of minor forest products has recently been transferred from the Utilisation to the Chemistry branch. The branch is very largely engaged either in direct war work, item 2(i), or on material of which the war has produced a shortage and which therefore can be classified as a part of item 2(i). Examples are producer gas, ephedrine, santonin, substitutes for carnauba wax, pectin, etc., etc. No province has been able to spare a man as minor Forest Products Officer, who must be a forest officer familiar with forest conditions, and this has hampered war work. He, for instance, should have been dealing with producer gas, rubber etc.

The Utilisation Branch.—As the whole of this branch has been employed practically continuously on war work, details need not be given here. Practically the whole of the work has been directly or indirectly on item 2(i).

5. It will be seen that from all principles laid down by Government, the Utilisation, Chemistry and Entomology branches should be continued at full strength during war as they are continuously concerned with the war effort. There might, however, be a difference of opinion whether during war the Silviculture and Botany branches should be continued at full strength. It should be pointed out that there are two kinds of staff at the Institute (a) forest officers; and (b) officers permanently employed by the Government of India who are not forest officers. Apart from the above two classes there are of course a very considerable number of subordinates of various sorts amounting to 461. For practical purposes therefore there can be no question of dispensing with the services of these men under (b). But there is the very important question of whether forest officers should have been relieved to supply the known shortage in provinces. Actually the Institute has relieved its officers to help the war effort whenever it was thought that they could be of more direct use in another capacity. In the Botany branch the only forest officer there—Dr. Bor—was released as soon as a demand came for his services in Assam and because it was thought that under the policy outlined in para. 2, the remaining officers, who were not forest officers, could carry on. Dr. Kapur, the head of the Seasoning

section, was released more than a year ago for Ordnance and later for the Supply Department because there was a trained man here to take his place and the rifle factories needed Dr. Kapur. The Seasoning section has trained and released other men for seasoning work for Ordnance since. There have been many other examples.

6. The Silviculture branch is the only one where forest officers have been continued not entirely on war work. The branch consisted of the Silviculturist in charge, Mr. Griffith, the Assistant Silviculturist, Mr. Dent, both of the Imperial Forest Service, the Statistical Assistant Silviculturist, Mr. Bakshi Sant Ram, and the Experimental Assistant Silviculturist Mr. Jagdamba Prasad, both of the Provincial Forest Service. Mr. Dent has recently been relieved as the Bengal Government needed his services. The Punjab asked for the release of Bakshi Sant Ram in October 1941 but, when it was pointed out to them that he was finishing off work which was the result of money and time expended over the last 20 years, they agreed to leave him here till he had finished those long term items. He is due to return to the Punjab in April 1943. That will leave only the Silviculturist in charge and one Assistant to carry on and if Bakshi Sant Ram is not replaced (and he can be replaced from within the service) it will mean the curtailment of a large amount of statistical work which has been going on for very many years. If Mr. Dent is not replaced, it again means that valuable information which has been accumulating in the files of the Silviculture branch ever since I was Silviculturist, which it has been impossible to reduce in an assimilable form, will continue to remain in those files. Apart from other publications the Assistant Silviculturist at a very short notice produced Leaflet No. 22 which has been the basis of much of the work done to combat the rubber shortage.

7. I have not yet mentioned education. Men are retiring and provinces must replace the wastage. The forest representatives on the Board know themselves the need of staff in the provinces and the proof is that their demand for seats has increased to make a class of 28 members in the Superior class, while the demand for Ranger seats has necessitated the doubling of the class which now has 70 students in residence divided into two classes of 35 each.

8. The war policy is for members' discussion but I hope they will endorse the general policy followed and more especially that they will agree on the necessity, even during war time, of filling the vacant posts of the Silviculture branch and that of the Minor Forest Products Officer. Many members of this Board of Forestry emphasised the importance of both posts even during war time at the last Silvicultural Conference and at both meetings of the Central Advisory Board on forest utilisation.

POST-WAR POLICY.

This is inserted for members to offer whatever suggestions they may wish. Presumably they will not alter materially the general policy given in Appendix IV of the Forest Department Code but they may have something to say about the detailed method of carrying out that policy. This question is connected with agenda items (1) the utility of the Institute and (2) provision of staff in the Institute and Colleges, in fact logically should have preceded the other two and has only followed them because those were of more interest to non-technical members of the Board.

In introducing the item, Mr. Howard said:

"The question of war policy of the Institute is given in the paper on this item. But it would be a great advantage to me to hear your views, whether you approve or disapprove of the policy, and if you disapprove then where you disapprove."

"The policy of the Institute has been very definitely that war research comes before any item in any programme. The Utilisation, Entomology and Chemistry and Minor Forest Products Branches have, for instance, been almost wholly and continuously engaged on war work. Apart from war time research

taking precedence over all other items long term items of research have been continued where it would mean loss of much past work and money if they were dropped."

"It has also been the policy of the Institute to relieve forest officers engaged at the Institute whenever it was thought that their work would be more useful to the war effort outside. The latest case in point is that of Mr. Bhargava the head of the Paper Pulp Section who, although he was doing excellent work here, was, as a matter of fact, released two days ago and made the Paper Commissioner for India."

"If you take the Branches mentioned above you will find that they are almost wholly engaged on war work. There are left the Botany and the Silviculture Branches. Now, the Botany Branch has at present no forest officer in it. If you close down its activities, it would apparently not help the forest war effort rather it would hinder the war effort of the Institute because it is dependent on that branch for certain links in the chain of war research. There was a forest officer in the branch, Dr. Bor but when it was thought that he could be more usefully employed for the war in Assam, he was allowed to go back to Assam."

"The most debatable item is the Silviculture branch. Let us admit straightaway that war supplies from the forest obviously must come before the silvicultural research. Let us also admit that the only contribution which the Silviculture branch can make to the war effort is the knowledge that exists stored away in the files of the branch and which has never been reduced to such proportions as can reasonably be read by anybody. Naturally silvicultural research in the provinces has largely been curtailed, and that has meant that the branch here has had to take on more and more silvicultural work at the Centre to keep the research alive. I suggest that even in war time it is a good thing to have one silviculturist like Mr. Griffith, so that he may look after your interests generally. But if he is to look after those interests, he must have some assistance. Mr. Griffith will lay his own case before you as to what has been done by the Silviculture branch during war time."

"I may tell you also that the question of forest education depends largely on the provision of the necessary staff for teaching in the various branches. I am perfectly certain that you are all agreed that the only person who can teach foresters is a forest officer—you don't want university professors."

"So far I have dealt with war time policy. So far as post-war policy is concerned, I have only put in the item in case members of the Board would like to express any opinions about the post-war policy of research. So far as I am concerned, I am perfectly content and happy to leave post-war policy to develop itself at a later date. The only thing which I do propose to say is this. There is here a Timber Development Officer—a rather unfortunate name. But he is really an engineer. Forest engineering is becoming more and more important, and it is impossible to deal with the particular problems that arise here without an officer with proper qualifications. So far as I can envisage, after the war, this Timber Development Branch is likely to be made into a larger branch with the particular object of advising provinces on exploitation and engineering problems and advising the Institute on engineering problems. That is the only change in post-war policy that I can see at present."

Mr. Hall.—"So far as the general proposal of filling the posts is concerned I will certainly agree. But the question is how to fill them."

Mr. Griffith said that the present position was that the Assistant Silviculturist, Mr. Dent, had comparatively recently gone back to his province, and the Statistical Assistant was due to go back to the Punjab next April. So far as the actual war policy of the Branch was concerned, it was briefly that so far as new projects were concerned no long term projects were considered and only those short-term projects which were likely to get immediate results affecting war problems or practical forest management were being started. With regard to the existing projects, they were making a systematic examination of everything that could be curtailed temporarily or permanently. If the

Board wanted to close down the whole Branch it could easily do so. But, at the same time, they had to realise that they would lose the results of many years work and experiment. Mr. Griffith deplored the tendency to close down research branches after many years of work and after very useful results had been obtained without writing up and ledgering the information. He pointed out that such results if not summarised and published remained with the particular officers who had done the work and would be lost for the future.

As regards the actual war work which the Silviculture branch did, it was not in any way spectacular; but a good deal of the work of the branch formed the basis of the war work of all the other branches. He reminded the Board that the Silviculture branch was the only branch of the Institute which was staffed with forest officers and which was in close touch with the provinces through their own silviculturists. Not only did the Silviculture branch of the Institute deal with the provinces but it also dealt with enquiries from private persons, firms, Indian States, and other Central bodies like the War Resources Board. For example, during the last two years it had produced information on more than 2000 enquiries. Such information was not an easy thing to obtain; sometimes it took time; but they had to produce the information, if it was to be useful to the war effort, in the shortest time possible. Mr. Griffith cited the example of how they produced the information on new rubber sources in a short time. He also stated that the only information at present available on forestry in Burma, Java, and Malaya was very largely to be found in the files of the Silviculture branch. It was the job of the Assistant Silviculturist to dig out and produce all information required in a reasonable time. At the moment the ledgering and information service of the branch had fallen into arrears owing to lack of an assistant silviculturist. They had no less than 2000 specific files and 600 general files. Many of those files were so large that it took a considerable time before the required information could be got out of them. It was therefore, necessary to reduce those files to readable proportions. If they had an Assistant Silviculturist, they could deal with the situation. Mr. Griffith also referred to the large number of records, bulletins, leaflets, etc., issued by the Silviculture branch during the last two years. They had answered over 2000 enquiries for information. In addition they had well in hand the revision of the experimental manual. All this work could only be done quickly if they had an Assistant Silviculturist.

So far as the Statistical Assistant was concerned, Mr. Griffith reminded the Board that the Statistical Assistant was the only statistician in the Institute, and his work was not necessarily confined to the Silviculture Branch, but extended to all the Branches of the Institute. War problems affecting utilisation, entomology and botany had to be referred to the Silviculture branch for statistical advice. Without a Statistical Assistant it was impossible to cope with the increased work and increasing enquiries relating to the war.

To a question whether the statistical and other work of the Silviculture branch could not be postponed till after the war, Mr. Griffith replied that if the work were to lapse into arrears it would be almost impossible to catch up. The Statistical Assistant had not only to answer enquiries from provinces and other branches of the Institute but also had to furnish information to other bodies engaged on war work.

Sir Harold Glover suggested the re-employment of retired officers if provinces could not spare any of their own.

Mr. Griffith stated that he would be prepared to take retired officers, except that the statistical assistant must be a man who could carry on the job without special training.

Mr. Harlow enquired whether the Statistical Assistant should be an officer of the forest department.

Mr. Griffith replied that a forest officer was preferable, for otherwise it would take a long time for a non-forest officer to learn the forest side of the job and settle down to his work.

Sir Harold Glover: warned the Board that the requirements of the Institute not only during the war but also after the war for post war research, should be considered against the background of provincial requirements. In view of the great difficulty of providing the necessary staff in the provinces, Sir Harold was of the opinion, that, although he agreed that war time research activities should be kept going, there should be no expansion of the programme of the Institute at present.

At the suggestion of Mr. Howard, the Board recorded as follows:—

"The Board approves of the general war policy adopted by the Institute. As a matter of general policy it also approves that the Silviculture branch should continue at full strength provided staff is available."

ITEM No. 2.—PROVISION OF STAFF AT THE FOREST RESEARCH INSTITUTE AND COLLEGES, By S. Howard, Esq., I.F.S., Inspector General of Forests to the Government of India and President, Forest Research Institute and Colleges.

At the Forestry Conference which met in Delhi in 1937, which was composed of representatives of provinces and Indian States and included representatives who were either Ministers or members of the Indian Civil Service, this question came up under the heading of "Staffing and distribution of posts on the India List". The discussion showed that after provincialisation there must be difficulties about getting forest officers seconded to the Institute because it was obviously not possible to have a provincial allocation of research and teaching posts. Unless efficiency is to be given the go-by it is not possible to say at a particular moment that say Bengal should provide a Utilisation Officer, for at that particular moment the most suitable officer might be in another province. It also came out in discussion that if there was no allocation there could be no obligation on an individual province to supply a man at a given moment. There was also some fear expressed that the reduction in the posts reserved for forest officers might lead to the appointment of unsuitable men in posts which essentially demanded a knowledge of the forests themselves. This was finally summed up in a resolution which said—

"The Conference is of opinion that, considering the highly specialised qualifications required for the India List posts which the Government of India propose, subject to the approval of the Secretary of State, to reduce practically to the minimum necessary to fill research and educational appointments at Dehra Dun, allocation of these posts to provinces by designation or numbers is not practicable. Realising the benefits to India and to themselves of these posts being filled by men of the highest qualifications, Provinces will be prepared to lend, so far as possible, the best available officer for the purpose, and the Government of India will pay for his services during the period that they employ him according to the ordinary deputation rules."

2. There are certain posts at the Institute on the Government of India list reserved for members of the Indian Forest Service and there seems no reason to discuss any revision of those posts. But presumably the general opinion is that whenever possible it would be advantageous if every post could be filled by a forest officer. It is fairly obvious that a large number of these specialised posts cannot ever be filled by forest officers. But that does not alter the fact that if a forest officer were qualified to fill the post, it would be preferable to appoint a forest officer than to appoint a man with no knowledge of forest conditions. I take an example of the Forest Entomologist. This is a post not reserved for members of the Indian Forest Service. The first qualification for the post is an advanced knowledge of entomology but in fact it has been filled by forest officers since its creation, except for a short period previous to 1911. One of the criticisms levelled against the work of this Institute by forest officers is that the results are not always of practical application in the forest.

3. Although the war has brought out the difficulties of the present system, it only concentrates difficulties which may equally well arise in a less acute form at any given moment in any one province. During the past year there has been a demand for (a) an Assistant Instructor for the Superior class, (b) an Instructor for the Rangers class, and (c) a Minor Forest Products Officer. In addition to that, men whose original deputation has ended or is ending have had to return to their provinces owing to pressure of work there. Even before the war had affected provinces one appeal completely failed for a post which has been demanded by every conference since 1925. But in each case by the very essence of the system the judgment of whether a name should be put forward for the post has rested with the province itself and, being hard pressed, no province has put forward any name, let alone a selection of names so that a picked man could be brought to the Institute. The reasons for this are fully appreciated. A province hard pressed for men is unlikely to send up a name and sometimes when a name has been submitted it has fairly obviously not been a name specially picked out but rather the easiest man to spare at the moment. No doubt each province hoped that somebody else would fill the post. I have no doubt myself that if the same proposal had been put to you here gathered together whether, for instance, you would prefer the second Ranger class to be closed down or provide an Instructor, that a man would have been found.

4 This obviously is mixed up with item No. 1 "The utility of the Institute to Provinces" and by Institute I include the Colleges. In cold blood here, for instance, I imagine the filling of the post of Minor Forest Products Officer will probably be admitted as more important war work to deal, say with the rubber shortage than almost any individual Deputy Conservator of Forests' work in a province. Yet there is no officer at this Institute who is really in a position to have the requisite knowledge. The Institute was able to collect and supply what I think was admitted to be important information about the rubber question and was able to get specialised staff for dealing with it but the fact remains that the officer who ought to have done this did not exist and the officer who collected together and compiled the information has since left the Institute, and even he only did it, a side issue extra to his ordinary work.

5. That is the position for discussion, namely, to try and invent some method by which the relative importance of the posts to be filled here and the loss of a man from a province is not left for judgment to the two most interested parties, namely, the Institute who wants the man and the province who does not want to let him go, and how to get the best man for the job and not the man who can most easily be spared.

Mr. Howard: "Gentlemen, The paper which introduced this item and which you may or may not have read can be summarised by saying that for the posts here which should be filled by forest officers, there is under the present constitution no method by which the Institute can count on getting the officers it needs at any given moment. The work here which must be done by forest officers is education and at least the branch officer in Silviculture and Utilisation. It is also universally admitted that there must be a forest officer dealing with, Minor Forest Products, and I mean a forest officer who has real experience of forest conditions. It is almost as necessary that the branch officers of Botany and Entomology should be forest officers. It would no doubt be preferable if all the posts in the Institute were filled by forest officers but that is unfortunately impossible."

"To deal first with Education, I need not tell you how necessary it is to continue the classes during the war. You have already given me your answer by increasing your demands for seats in the superior class from 16 to 28 and by doubling your demand for Rangers during the war so that at the present moment we have 70 rangers always in residence as opposed to the 34 which we had before the war. Yet the Institute has been unable to obtain the extra staff from the provinces which is necessary to cope with this increase. Luckily there

has been no breakdown because I have been able to employ a retired conservator as an Instructor of rangers, a procedure upon which we cannot always rely and which is not altogether desirable, and the fall of the Andamans released another officer to complete the staff of the superior class. I suggest that it should not be necessary for the Japanese to capture the Andamans in order to provide an Instructor at the Forest Research Institute. Such a method of recruitment reminds one of Charles Lamb's chinaman who burnt down his house in order to enjoy a dish of roast pork."

"Coming now to Research. You will see that the Utilisation branch is solely engaged on war problems. It has been again impossible to obtain an officer from any province when the branch was at breaking point. But it is an ill wind that blows nobody any good and again the Japanese action in the Andamans released a suitable officer at the right moment and they had greatly helped the war effort here—no mean effort either."

"The same difficulty has been felt in obtaining the Minor Forest Products officer. He should have been here to deal with the very important matter of plants to replace the rubber shortage. The technical staff of the Chemistry branch has been able to deal with the work of analysis of the latex, but that branch, which is under Dr. Krishna, still lacks the officer who would be generally in touch with the forest side of the work. I could give many examples of his need and importance in war research e.g., the work on ephedrine, on producer gas or on the rubber shortage."

"As Mr. Griffith has told you, there is no Assistant Silviculturist."

"Whether or not we can obtain these officers, I do hope you will consider the relative importance of their work at the present moment in war compared with the importance of the individual war work of men working elsewhere. We have temporarily solved the education problem as well as the problem of the Assistant Utilisation Officer. We have now to solve the question of the Minor Forest Products Officer, the question of the Assistant Silviculturist and the Statistical Assistant of the Silviculture branch."

"I would like to make clear the distinction between the general question of providing staff at this Institute and the particular question with which we are now concerned, namely, that of the provision of staff during war time. Under the present constitution we cannot call upon a province to give us a man at any given moment and there is no cadre here at the Centre from which we can provide that man. That is the general question of much wider significance than the particular problem of the moment."

Mr. Simmons referring to the question of the provision of educational staff, pointed out the difficulty that once an officer was appointed to the college here he would eventually like to go back to his province lest he should lose his prospects of promotion.

The general opinion of the Board was that a man of conservator's standing should not be put as an Instructor at Dehra Dun although in practice it has not happened.

Mr. Hall enquired whether the difficulty of getting officers applied only during the war or whether it existed before the war.

Mr. Howard said that although they had got all their men before the war, and were getting most of the men during the war, the war had brought out exactly where the arrangements might break down.

In reply to question from Mr. Simmons, Mr. Howard informed the Board that the Secretary of State had laid down that 9 posts at this Institute should be reserved for I. F. S. officers.

Mr. Simmons said that it might be difficult to convince his Government that they should include in the provincial cadre India List posts, until it was decided how many such posts must be held by forest officers.

Mr. Howard agreed that it was entirely for the provinces to decide whether they would send a man to the Institute or not. That in fact was the difficulty.

Mr. Hall said he did not think there should be any great difficulty in sparing an officer from the provincial cadre but the Institute could not always get an officer by name.

Mr. Harlow also stated that there would be no great difficulty in providing the necessary staff for the Institute.

Mr. Howard asked whether provincial governments would agree, even if the Board decided, that each provincial government should always provide one post on its cadre for the Institute.

On this question the Board felt that no difficulty would arise.

Chairman: "You know I am in the habit of thinking aloud and when any idea comes to me I put it before you for your consideration so that I may test how far any improvement is possible, which has your approval."

"I mentioned to you yesterday my idea of improving education. I have to say something now about research and the problem of providing staff for the Institute. From the discussion that has taken place it is quite clear that our Institute is at present entirely at the mercy of the provinces. We can approach them and ask them for a certain officer, but, as *Mr. Hall* pointed out, the autonomous provinces may be altogether reluctant to spare their best men for us. I need not emphasise that we require the very best men for the Institute to carry out research and to train officers for the Forest Service."

"It has occurred to me that it may be possible and the discussion that I have heard drives me to no other conclusion—that we might consider the forming of a Federal Service. The Federal Service in the first instance, would be needed for our college; it is possible that provinces might feel the need of drawing on our reserves of highly qualified officers. The men at the Centre would possess an all-India experience, and this would be of great value to provinces to solve some of their problems. They might draw upon their services just as we now draw upon Provinces services. It seems inevitable that we should take some kind of action to provide ourselves with the officers required for the college and the Institute. It would be a great help if you could make some constructive suggestions as to the needs of such a service—whether the nucleus of a federal service should be formed, the functions it should perform and so on. It is true the officers of the federal service will have to acquire actual experience of forests."

"The Centre has got no forests of its own, except the Andamans which are not at present available. Would it be possible to lend our officers to the provinces, so that they may acquire the necessary practical experience of forest management and utilisation? We can consider a workable scheme for forming a federal service. I feel in the future there will be an increasing tendency on the part of the Provinces and States to become zealous of their own rights; on the other hand the value of reciprocity may become more transparent. I have been much impressed with the ability, experience and power of expression of Senior Forest Officers at this meeting. I feel that we should see that officers of similar capacity are available to protect and promote the development of forest wealth. This is my only reason for venturing to suggest an examination of the question of improving the training of our future forest officers and the formation of a Federal Forest Service."

"I am also anxious to help and strengthen the research side of this Institute. I have been connected in one way or the other with many research schemes. I speak from experience that it is not always possible to get men, who have a bent of mind for research. Government Service being what it is, it happens that once a man gets a particular job he remains there whether he is fit for that job or not, in the matter of research this may mean a loss of precious time—a waste of 20 or 30 years. Could there be some way which would permit testing a man's ability within the first two years of his service?"

"Another question which worried me is whether research and administration can be in one hand or whether research and administration should be separated. I know these questions cannot be decided in a short time but it is for you to consider them as long range problems and when we next meet we may have concrete constructive proposals."

"In conclusion—I do not think I will have another opportunity of meeting you again—I wish to say how pleased I am to meet you, to listen with interest to the discussions that have taken place, to have seen with my own eyes the work that is being carried out here, and to some extent to have gained some idea of the scope for future development of the work here. I hope it will be given to me to plan a programme of future development."

Sir Harold Glover: "I think the suggestion of *Sir Jogendra Singh* might help us very much. It will provide a cadre of officers at the disposal of the centre whom it can send out to provinces, and whenever you want a Research Officer with certain qualifications you will be able to draw upon your own men. A certain amount of transfer between Federal Service and the Provincial will be a corollary of this suggestion."

Mr. Hall: "If the Government of India persuaded the Provincial Governments to include in their cadres a man for the Forest Research Institute, would you prefer that?"

Mr. Howard: "If they would do that, I believe it is probably the best solution. But the difficulty has only arisen because of provincialization."

Mr. Atkinson: "I agree with *Mr. Hall*, and I think that that is the logical solution. I don't generally welcome the idea of having eleven men here forming the nucleus of a Federal Service to be exchanged with provinces. Now, as only few of your Federal Service Officers might prove suitable research officers, and you might then arrive at the anomalous position of having all eleven Federal Service Officers working in the provinces and all their scientific research posts filled by provincial men!"

The meeting then considered the particular question of whether in war time provinces were prepared to spare the staff which the Institute was actually lacking at present. The posts which required to be filled at the Institute immediately were those of the Minor Forest Products Officer, an Assistant Silviculturist, and a Statistical Silviculturist.

Mr. Hall suggested the appointment of retired officers or officers from Burma to the research posts as a stop-gap arrangement.

Sir Harold Glover was also of the same view.

Mr. Howard pointed out that for the post of Minor Forest Products Officer they wanted an officer with eight or ten years practical work under Indian forest conditions. But *Mr. Howard* agreed that the appointment of officers from Burma might provide a stop-gap solution although not the best solution.

Mr. Simmons referring to the question of the appointment of officers from Burma informed the Board of the practical difficulty in the case of Assam. A Burma officer could not very well be put in charge of a division because there were objections on the score of interfering with the interests of the P. F. S.

After discussion it was decided that:—

"In the opinion of this Board the post of the Minor Forest Products Officer should be filled at once. The Board recommends that Provinces should be again approached to provide an officer, but failing that it should be filled by an officer from Burma."

The Board next considered the filling of the post of the Statistical Assistant Silviculturist, the Experimental Assistant Silviculturist and the Assistant Silviculturist.

Mr. Simmons was of the opinion that one of these two posts might be held in abeyance for the present.

Mr. Griffith suggested the order of importance in the filling of the posts as (1) Statistical Assistant Silviculturist (2) the Assistant Silviculturist, and then (3) the Experimental Assistant Silviculturist.

Mr. Howard: "We are now discussing whether the Statistical Silviculturist's post should be filled. He need not necessarily be an I. F. S. officer. All that is needed is that the officer should have specialised in statistics."

After discussion it was agreed that the post of Statistical Silviculturist could be filled from the Burma staff.

The Board finally recorded its full opinion on this item of the agenda as follows.—

"The difficulties of providing forest officers for staff at the Forest Research Institute were pointed out at the Delhi Conference in 1937. To solve these difficulties two proposals were put before the Board:

(a) that a small Federal Central Forest Service should be created to fill the Institute posts. These officers might be exchanged with provincial officers as and when necessary. The effect of this would be that no Forest Research Institute posts would be provided for on provincial cadres.

(b) that provinces should undertake definitely to provide a certain number of posts on the provincial cadre which would be supplied to the Institute on demand. This is practically the arrangement before provincialisation.

The Board cannot decide on such a debatable question off-hand and it suggests that the Central Government should indicate the implications of these proposals and then approach provinces for the provincial views. At the same time it agrees that the number of posts at the Institute which must necessarily be filled by forest officers should be defined and reduced to a minimum.

On the particular question of providing staff to fill the present vacancies during war time, the Board is of opinion that the Minor Forest Products post should certainly be filled at once. Provinces should be again approached to provide an officer but if none were offered then the post should be filled temporarily by a Burma officer.

The Board also agrees that the post of Statistical Assistant should be continued after Mr. Sant Ram returns to the Punjab and that the vacant post of the Assistant Silviculturist should be kept filled if it is possible. They consider that provinces should again be approached to provide men for these posts, but if provinces are unable to provide men then the posts should be filled for the present by Burma men or possibly by retired officers.

In general although difficulties in getting the required staff may occur, the Board feels that when the situation is eased after the war many of the difficulties will probably disappear."

Sir Harold Glover at the conclusion of the proceedings, said

"We would all very much like to thank the Honourable Sir Jogendra Singh for having presided over our deliberations and also to thank the Institute authorities here for their hospitality and for showing us round. I may assure you that, however, critical we may appear to have been, we are really very appreciative of the value of the work that is being done at Dehra Dun. Dehra Dun is a reminder to us when we are engaged in day-to-day administration that we still belong to a scientific profession. I believe I am right in saying that the general public also have a very high opinion of this Institute, and I may assure you of the continued support of the provinces. (Hear, hear.)"

Mr. Howard: "On behalf of my staff, I thank you all very much. I may tell you that it is extremely pleasing to me to hear that you all appreciate the work that has been done at the Institute. Although I am one of you forest officer, I do on behalf of the staff of the Institute thank you very much indeed; for having recognised the importance of what it is doing for the war."

Honourable Upendranath Barman: "On behalf of my colleagues and myself, I thank you for your hospitality. My special thanks are due to the President of the Institute Mr. Howard. We think it profitable for us popular representatives as we are called to get to learn so much of your views and of what is being done here, and I thank you all for it."

(Applause).

The meeting was adjourned—*sine die*.

SUMMARY OF RECOMMENDATIONS.

AGENDA ITEM I.—INCREASING THE UTILITY OF THE FOREST RESEARCH INSTITUTE TO PROVINCES.

The Board summarises its ideas for increasing the utility of the Forest Research Institute to Provinces as follows—

(1) Provincial Silviculturists and Utilisation officers should come to Dehra Dun as a matter of course.

- (2) Local staff should assist the Institute as much as possible.
- (3) Local officers should be encouraged to come to the Forest Research Institute and work in the branches for a longer or shorter period.
- (4) Research Officers, and especially Branch Officers, should have every facility for touring in the provinces.
- (5) Demonstration courses should be revived.
- (6) The Hon'ble Member's suggestion of a Senior Forest Officers' conference will help relations between the Institute and Provinces.
- (7) Whenever a research officer visits a province or passes through it, even on work not directly connected with the forest business of that province, he should inform the local forest officials so that they can meet him. This is especially applicable to places like Bombay, Nagpur and Calcutta. Forest officers from Bengal, Assam, Bihar and Orissa will all be interested to know when research officers are in Calcutta.
- (8) The Institute should continue to print and issue the short leaflets now being sent out which are helping to bring the Institute work into touch with provinces. One copy of all such publications should be specially earmarked for the provincial ministers.
- (9) As speed of publication is very important, the President, Forest Research Institute should have ample powers for local printing. It is suggested that he should be permitted to sanction up to Rs. 500 on each item provided he has the amount in the budget.
- (10) The Board does not agree with the suggestion that visitors to the Institute should send a confidential report on its work to the President but suggests that the President should see such visitors before their departure and get from them their opinion.
- (11) The more direct contact there is between any visitors and the actual worker, for example, the officer-in-charge of a section, the better. It is suggested that contact is greatly helped by social intercourse outside office hours.
- (12) It is the function of the Institute to inform the general public of the work of the Forest Department, which local forest officers often have no time to do. Officers at the Institute should be encouraged to write up their work in popular language to make broadcasts etc. Such articles or broadcasts should not be confined to research work, they should also deal with the work of the forest department in general.

AGENDA ITEM No. 2.—PROVISION OF STAFF AT THE FOREST RESEARCH INSTITUTE AND COLLEGES.

The difficulties of providing forest officers for staff at the Forest Research Institute were pointed out at the Delhi Conference in 1937. To solve these difficulties two proposals were put before the Board:

(a) that a small Federal Central Forest Service should be created to fill the Institute posts. These officers might be exchanged with provincial officers as and when necessary. The effect of this would be that no Forest Research Institute posts would be provided for on provincial cadres.

(b) that provinces should undertake definitely to provide a certain number of posts on the provincial cadres which would be supplied to the Institute on demand. This is practically the arrangement before provincialisation.

The Board cannot decide on such a debatable question off-hand and it suggests that the Central Government should indicate the implications of these proposals and then approach provinces for the provincial views. At the same time it agrees that the number of posts at the Institute which must necessarily be filled by forest officers should be defined and reduced to a minimum.

On the particular question of providing staff to fill the present vacancies during war time, the Board is of opinion that the Minor Forest Products post should certainly be filled at once. Provinces should be again approached to provide an officer but if none are offered then the post should be filled temporarily by a Burma officer.

The Board also agrees that the post of Statistical Assistant should be continued after Mr. Sant Ram returns to the Punjab and that the vacant post of Assistant Silviculturist should be kept filled if it is possible. It considers that

provinces should again be approached to provide men for these posts, but if provinces are unable to provide men, then the posts should be filled for the present by Burma men or possibly by retired officers.

In general although difficulties in getting the required staff may occur the Board feels that when the situation is eased after the war many of the difficulties will probably disappear.

AGENDA ITEM NOS. 3 AND 4: RESOLUTION ON ITEM 12 OF THE SILVICULTURAL CONFERENCE, 1939, REGARDING EROSION AND FORESTRY IN INDIA AND RESOLUTION ON ITEM 11 OF THE SILVICULTURAL CONFERENCE, 1939, REGARDING MANAGEMENT AND IMPROVEMENT OF FOREST GRAZING.

The Board feels that erosion and grazing control are so intimately connected that it must consider them together. Although in some Government forest areas grazing is already controlled, in many, control is still most inadequate. Grazing in areas outside Government forest is often quite unrestricted and in these areas control is even more important than that in Government forests. There is an urgent need for:—

(1) some administrative machinery to control and limit the grazing incidence to what the land can stand;

(2) propaganda to pasture users;

(3) the collection of local data on grazing incidence;

(4) the application of that data without undue delay.

Grazing is not the only problem which affects erosion. In Assam, and in many other provinces, the erosion problem is intimately connected with that of shifting cultivation. Plans can be evolved to regulate shifting cultivation and such plans should be evolved. The regulation of shifting cultivation is a matter of general land policy which it is for Government to define.

Turning now to erosion in particular, the Board wishes to record that the urgency and importance of the problem is so well known and admitted that there is no need to stress it here. A good deal of experience of erosion control has already been gained in the United Provinces, the Punjab and Bombay. Sir Harold Glover has contributed an abstract attached to these proceedings (Appendix I) which shows what is being done in the Punjab.

The Board considers, however, that as soon as war activities permit, an officer or officers should be appointed at the centre to define by regions exactly what the problem of erosion and floods is. Such regions would be a river basin or a set of river basins. This officer or officers should later be expanded into an all-India Soil Conservation Service. It may be necessary to set up a different agency in different provinces to deal with the solution of the problem. But whatever the particular method may be in a given province, the Board feels that the time has come when the magnitude and urgency of the problem is such that probably it needs a complete special Soil Conservation department in each province, preferably with a forest officer at its head, to advise Governments about general land policy and to carry out recommendations for erosion control and land management. The actual control would probably of necessity be regional by a river basin or a set of river basins.

The recommendations for erosion control would presumably be made by a sort of Soil Conservation Board composed of representatives of the Central Soil Conservation Service and the Soil Conservation Departments of the various provinces.

AGENDA ITEM NO. 5: DESIRABILITY OF ESTABLISHING ADVISORY BOARD ON FOREST UTILISATION IN ALL PROVINCES.

The Board notes the opinions expressed in the papers submitted. It feels that whether such local advisory boards are appointed or not is a matter for each province to decide for itself. It would perhaps be preferable to defer the appointment of any such boards till after the war. The Board also considers that there should be a stronger representation of non-officials on the Central Advisory Board on Forest Utilisation.

AGENDA ITEM NOS. 6 AND 8: SURVEYS OF TIMBER AND OTHER FOREST PRODUCTS AND DESIRABILITY OF APPOINTING AN ECONOMIC BOTANIST IN EACH PROVINCE.

The Board considers that these two items are so intimately connected that it is better to treat them together. It agrees that theoretically such economic surveys are desirable. But for timber it is often not possible to carry out such a survey, particularly during war, owing to the very large expense involved till there is some indication of a demand for the particular species in the near future. When such a demand is likely, the survey is already automatically legislated for at the revision of working plans.

For minor forest products, however, such a survey is rather different and does not consist in expensive enumeration. Often it only means the identification of the plant concerned with a record of the locality and soil where it is found and eventually its experimental cultivation as a crop.

The Board would like to emphasise the very great importance of the proper guarding and clearing of many of these minor forest products and it emphasises the necessity of taking steps to guarantee the purity of the article. It suggests that the Forest Research Institute might take up this matter and make recommendations.

It feels that in order to develop minor forest products it is necessary to link up:

- (a) the growth and production of the raw material
- (b) the research necessary
- (c) the actual industrial production.

The Board agrees that an officer in each region is advisable to do this work, preferably a forest officer with a knowledge of botany, and it considers that such an officer is needed at once at the Forest Research Institute.

AGENDA ITEM No. 7: CO-ORDINATION OF REGENERATION POLICY WITHIN AND BETWEEN PROVINCES WITH SPECIAL REFERENCE TO LIGHT HARDWOODS.

The provinces are already alive to the large demand for light hardwoods and are growing them wherever the soil is suitable and is not already used to grow more valuable timber. For some years to come, supply is so much less than demand that a co-ordinated plan of regeneration is hardly necessary. But a time will come when a co-ordinated policy of regeneration and in fact of all forest production between provinces will become necessary. It would add that some of these light hardwoods are sufficiently valuable and of sufficiently quick growth to offer possibilities of a profitable crop for private owners.

AGENDA ITEM No. 9 (A): PROVISION OF A FOREST SINKING FUND FOR POST-WAR EXPENDITURE.

The Board calls the attention of all Provincial Governments to the fact that as a result of advance feelings of forest capital for war supplies, forest revenues are abnormally high, and at the same time expenditure on the tending and general development of the forest property, which should be undertaken now, is being curtailed. After the war therefore, not only should expenditure be expended up to the normal, but a further increased expenditure will be necessary to make up the arrears of such work. It recommends strongly therefore that funds be created now out of excess profits to provide the expenditure necessary on forest reconstruction in the lean years which will follow the war.

AGENDA ITEM No. 9 (B): SENIOR FOREST OFFICERS CONFERENCE.

The Hon'ble Member suggested that in addition to the Board of Forestry, which would normally meet triennially, there should be a conference of senior Forest Officers to meet more frequently, if possible annually, to discuss technical subjects on the analogy of the Central Board of Irrigation. The Board endorses this suggestion.

AGENDA ITEM No. 10: WAR AND POST WAR POLICY OF THE FOREST RESEARCH INSTITUTE.

The Board approves of the general war policy adopted by the Institute. As a matter of general policy it also approves that the Silviculture branch should continue at full strength provided staff is available.

Indian Forest College.

1 *The Revised Rules.*—The Board considered the Revised Rules. It agrees that minor details should be left to the President and the Principal, and proceeded to vote separately on the major changes. These were:—

(i) *Education qualifications for admission to the College.*—The revised rules widening the qualifications are approved, but with the words "natural science" instead of simply "science"

(ii) *Admission of Rangers.*—The new rules providing for admission of Rangers under 30 years of age are approved.

(iii) *Age Limits.*—The raising of the age limit by one year from 22 to 23 is approved.

(iv) *Preliminary Practical Training.*—The new rule stating that preliminary practical training for a minimum period of three months is recommended, but that such training is not made compulsory is approved.

(v) *The Course of Studies.*—The Board approves the changes made in the course of studies and agrees that the detailed regulation of the course and the allotment of time to the various subjects should be left to the President and the Principal

(vi) *Official Recognition of the College Diploma.*—The Board approves the proposal that holders of the Diploma of the College should be styled "Associates of the Indian Forest College", with the right to use the letters A. I. F. C. after their names, following the letters indicating their university degrees, and agrees to recommend this to the Government of India for official sanction.

(vii) *Fellowship of the Indian Forest College.*—The Board discussed the proposal to institute the Fellowship of the Indian Forest College as a Research Degree. Decision was postponed for the time being, as the need for such a degree would not arise for some years. It is agreed that the matter should be omitted from the rules for the time being.

2 *Provision of Special Short Courses.*—The Board discussed the need for special short educational courses (as distinct from research demonstration courses) of a few months duration for Rangers over 30 of age about to be promoted to Superior Service, and for Class II officers about to be promoted to Class I service, and as "refresher" courses. While certain provinces consider that such courses might be desirable, none can give any guarantee that they could send men to such courses and in view of the expense that would be involved by the increase of staff that would be required for such courses, it is decided that no action should be taken for the time being.

3. It is agreed that if officers outside the Institute could give an occasional lecture to the students on special subjects this is most desirable.

Indian Forest Rangers' College.

4 The Board agrees that it was correct to raise the admission standard to Intermediate. The President, Forest Research Institute, has the power to waive this educational qualification and he should exercise the power freely for war service men when they return.

5. There was some difference of opinion about the type of instruction to be aimed in the Rangers' course. The Director, Indian Forest Rangers' College, pointed out that the educational qualification of the Ranger student was not much inferior to that of the Superior class student and that the Ranger student also received a two years course in the same way as the Superior class student. He considered that the Rangers training tended to approach that of the Superior Class. There was some difference of opinion whether this was altogether desirable. Nine of the delegates were of opinion that it was essential to keep the two types of training different and that the training of Rangers throughout must have a direct practical bias, four of the delegates, however, considered that the less difference there was between the training of the two classes the better, provided this was not done at the expense of practice.

6. The Board agrees that approximately the present scope of touring for Rangers is correct, namely the Punjab, the United Provinces and the Central Provinces. Mr. Rangaswami from Coorg dissented from this view and said that the Rangers' touring should be extended to South India.

7. There was a difference of opinion whether the successful completion of the Rangers' course should be recognised by the award of definite letters to be used after the name. Two delegates were in favour of this, four considered that a better decision could be made after some experience with the proposed Associateship for the Superior class and ten delegates were opposed to granting such letters.

8. The Board notes the remarks made by the Principal, Indian Forest College, and the Director, Indian Forest Ranger College, about the rise in the cost of living and the inadequacy of the stipend.

AGENDA ITEM No. 12: A GENERAL CO-ORDINATED STUDY OF BAMBOOS.

The Board notes Mr. Gardner's proposal to start experimental work on the safe period for bamboo fellings and approves. It appears that all provinces can co-operate in what is required for that particular portion of the investigation.

So far as the long term project of the general co-ordinated study is concerned, the Board agrees that provinces can supply a certain amount of the information which Mr. Gardner needs and will supply it, but the project as a whole can not be undertaken till after the war.

AGENDA ITEM No. 13: REGULATION OF FELLINGS AFTER THE WAR TO ABSORB ACCUMULATED ARMY STOCKS BY CONSUMERS.

On this resolution the Board of Forestry notes as follows:—

(a) The release of Defence Department stocks after the war must be controlled by a disposal board or some such agency and the Board of Forestry emphasises that the Forest Department must be adequately represented in any planning for such disposal.

(b) The Board of Forestry further advises that, in consultation with railways, steps should be taken to stabilise sleeper prices after the war.

(c) Owing to the advance fellings which have been necessary during the war only much lighter fellings will be permissible for some years after the war till the lost capital has been replaced. This obviously implies the early revision of all working plans particularly with a view to the reassessment of the yield on a conservative basis. A planned economy for the timber trade and for the development of India's forest estate is required and this policy must be sufficiently flexible to take account of the new and yet largely unforeseen conditions which will prevail at the end of the war.

APPENDIX I.—RECENT ATTEMPTS TO CHECK SOIL EROSION IN THE PUNJAB

At the request of the Inspector General of Forests Sir Harold Glover gave a short account of recent attempts to check erosion in the Punjab.

The Punjab is an agricultural province which is absolutely dependent on canal irrigation. On account of the low rainfall the canals derive their water from the rivers which issue from the Himalayas, and Government is perturbed at the possibility of any decrease in the winter flow of these rivers due to deforestation of catchment areas. In any case there is insufficient water for irrigating the vast areas of the plains and Government is contemplating the early formation of large reservoirs involving the expenditure of crores of rupees. It is essential that these reservoirs shall be permanent and there must be no chance of their silting up due to soil erosion in the hills.

Government and the public recognise the absolute necessity for conserving the forests of the Himalayas and for restoring the vegetation of the catchment areas by regulating the grazing. Serious erosion also takes place in sloping cultivated lands and the problem of erosion control is one of land management involving the proper treatment of forests, village waste and cultivated lands, in fact the proper management of the estate as a whole.

Government has sanctioned the formation of a special Soil Conservation Circle in the Punjab Forest Department, with seven Divisional charges and is already spending 4½ lakhs a year. The Cabinet is convinced of the need for further advance, but owing to the diversion of funds to war expenditure and to the shortage of trained staff we are unable to make more rapid progress.

The Forest Department is particularly fortunate in the backing which it has received from the Ministry,—particularly from the Hon'ble Sir Chhotu Ram, who on every tour in the eroded areas has addressed large meetings of villagers and lectured them on the need for proper forest protection and soil conservation. The Soil Conservation has formed a part of the rural development programme and owes much to the enthusiasm of Mr. (now Col) F. L. Haynes, C.S.I., C.I.E., M.C., I.C.S., late Financial Commissioner, Development, who has linked up the activities of the Forest Department with that of the Revenue, Agricultural and Veterinary staff. The Forest Dept. has received backing and encouragement from the senior members of Government, from the Commissioners from Deputy Commissioners and the Revenue staff. Soil conservation is a matter which concerns many Departments and all must work together.

Early History.—The deforestation of the Siwaliks led to the formation of torrents of sand which devastated large areas of agricultural land in the plains. In 1900, a Phos Act was enacted, and attempts were made to give effect to its provisions through the agency of the Deputy Commissioners and Commissioners. These officers, however interested they were, were unable to do sufficient to check erosion, as they were unable to devote detailed attention to this aspect of their revenue work. Mr. L. B. Holland, D. C. Forests was attached to the Civil Department, in 1916, for some years and afterwards reverted to the Forest Department.

In 1934, Mr. Hamilton, was attached to the Civil Department, but a link was made with the Forest Dept. as he was responsible to the Conservator for the correctness of his technical advice. This was a great step in advance, as it brought the Forest Department into close touch with erosion problems. Mr. Hamilton possesses the rare quality of fact, and convinced the people that something drastic must be done.

The Soil Conservation Circle was formed on 1st April, 1939, as a branch of the Forest Department. As the work develops a separate department may be established, but in any case, that department would have to be closely associated with the Forest Department, and should be staffed by officers who are accustomed to work over vast areas, who have particular knowledge of the problems of forest management, and who are suited by reason of their training to land management on an extensive scale.

The methods by which progress in Soil Conservation has been made will now be described in some detail.

Propaganda.—The first need was propaganda. It is essential in dealing with a problem which extends beyond provincial boundaries and rests on the social and economical conditions of the people that the public at large and Government itself shall be convinced of the need for action.

(a) *Government.*—In 1930, Holland and Glover wrote a paper for the Punjab Engineering Congress which dealt with erosion in the Himalayas and its possible effect on the water supplies of the Punjab canals. This attracted much attention and Government became convinced that erosion is a very serious problem.

(b) *The Public.*—Propaganda is an essential part of the Circle's work. Lectures in Urdu are constantly given in the districts; demonstration box models are exhibited to the people; lantern slides are shown and everyone in the Circle is engaged on propaganda, as it is essential not only to bring the problem to the notice of the people but to remind them of it constantly. Gorrie, who had travelled widely in America, wrote prolifically and interested a large audience throughout India. Pamphlets are issued in English and in Urdu illustrated by photographs, and very widely distributed.

Kangra Village Forests—(Drayna, 1941).

Rehriarpur Siwaliks—(Glover, 1941).

Siwalik erosion—(Hamilton, 1935).

Erosion in cultivated uplands, its cause and cure—(Glover, 1941).

(c) *The inhabitants of the tracts directly affected.*—The effects of erosion are generally felt more severely by the people who are living away from the forest tracts than by those who live in upper portions of the catchment areas and it is always difficult to convince the forest villagers of the needs for control as they are the people who first feel the effects of restrictions. Grazing is replaced largely by stall feeding and the people must be convinced of the material benefits which they will receive from increased fodder production.

Legislation.—The Forest Act, is very useful, particularly Sections 35 and 38, but it is not sufficient. A special Chos Act is in the Siwaliks and is now being amended and extended to the Kangra district. Later on it will become a Soil Conservation Act applicable to the whole of the sloping ground of the Punjab. Under this Act it will be possible to insist on proper cultivation and to exclude grazing animals from eroding areas.

Government insists on all matters of persuasion being exhausted before areas are closed compulsorily, but does not hesitate to compel recalcitrant villagers to toe the line when closure is not adopted voluntarily in areas where closure is essential.

Regional Plans.—A start has been made on regional planning, the area chosen being in front of the Siwaliks in the Bist Doab where the level of the sub soil water of the wells has fallen by many feet in the last few years. In these plans all factors of locality etc., are described as in Part I, of a Forest Working Plan; the measures to be taken are suggested, and described, as in Part II in which the action to be taken by each department is given.

The first elaborate Regional Plan is well on the way to completion.

Village Forest.—Kangra is a very fertile valley on the outer edge of the Himalayas. The villages and cultivation are scattered through forest and shamlat (wastel). The villagers had objected to forest management although given the fullest forest rights and erosion was severe. Government has very wisely decided to sacrifice forest revenue and to make it over to the villagers conditionally on the forest and village waste being managed under a Working Plan drawn up and approved by Government. An essential part of every plan is closure to grazing in rotation in order that erosion shall be checked. The Forest Officer employed is also approved by Government. Co-operative village forest societies are formed, as will be described in a subsequent paragraph.

Cultivated uplands.—A very large portion of the North West Punjab consists of cultivated uplands which originally must have been covered with trees, very few of which are now left. The country is badly ravined and the ravines cut backwards into the cultivated fields. At first sight it would seem impossible to do anything to restore this land, but the land hunger of the villagers is very great. They are very viable and industrious and are prepared to go to immense efforts to put these lands in proper order. The rainfall varies from 10" to 25" and the soil is generally a sandy loam. The whole of the catchment area must be terraced and peripheral ridges are made in order to retain the water *in situ*. This has been done by individual rainindars for many years. The people are small holders and must be taught to work together, as it is useless for any one man to terrace his field if his neighbours' fields are not in order. Land Reclamation Societies are formed under the Co-operative Department in order that the whole of the lands of each catchment area shall be re-conditioned.

In other tracts, particularly in the Attock district, the estates are very large and the outlying fields are cultivated by tenants-at-will who have little inducement to form permanent cultivation. The first essential is to induce the landlords to give long term leases and only then do the tenants benefit by the work they have done in terracing the fields and making the cultivation permanent.

Co-operative Department.—In the Co-operative Department, we have found a ready-made agency for the management of village forest and all village lands. Its reputation in certain tracts is excellent and special branches of the Co-operative Department have been formed for village forest and land reclamation societies. The soil conservation officers indicate localities in which forest or land reclamation societies are required. The Co-operative Department staff then tours intensively in these areas, and induces the people to form a village co-operative society. The enthusiasm of the villagers in districts like Kangra and Hoshiarpur is amazing. There is no need whatever to convince them either of the need for proper soil conservation or of the benefits received therefrom. Government makes small grants to these village societies and the villagers then do the work.

Annual Reports.—Attention is invited to the special Soil Conservation chapter of the Punjab Annual Forest Reports as the work done in each district during the year is reported on in considerable detail.

New Publications.—Mr. Hamilton is at present engaged on a pamphlet on Erosion and its control, which will be published by the Oxford University Press.

H. M. GLOVER,

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